

**Fragments of the past:
the challenges and contributions of an open air hilltop site**

**A study of the Middle Stone Age lithic material from the Botlhano Fela open air site on
Thamaga Hill in south-eastern Botswana**



Anna Alexandra Myrer
University of Oslo
Institute of Archaeology, Conservation and History
Master's Degree in Archaeology submitted 2010

Abstract

The excavation of Botlhano Fela on Thamaga Hill in south-east Botswana was initiated as a part of the Berkeley-Botswana Archaeological Project. One of the main aims of this project was to collect data that would contribute to the on-going “Kalahari debate”. However, the research focus had to be revised as the lower levels of the largest excavated area unexpectedly yielded a sample of material diagnostic of the Middle Stone Age period. An open air hilltop site with a deep occupational sequence is unique to the area, and is a rare occurrence in Botswana and southern Africa.

The lithic assemblage from the site was divided, based on differences in stratigraphy, for the purpose of two independent research studies. The substantial collection of lithics from the Middle Stone Age levels are the material basis for this thesis. Unfortunately, the assumption of a clearly defined stratigraphy was, however, erroneous. Results of refitting analysis determined that although the site was considerably disturbed, new information could still be obtained.

As the majority of the assemblage consisted of débitage from all stages of manufacture, the *chaîne opératoire* approach was chosen to determine activities visible in the archaeological material. An extensive array of raw materials were chosen for lithic reduction, where quartz and cryptocrystalline materials are prevalent types in the assemblage. Potential sources for the raw materials were identified in vicinity of the site. The partially cleaned and prepared cobbles were transported up to the hilltop, where a large amount of knapping and production of tools occurred. The analysis of the Botlhano Fela assemblage stands as an example of how an open air site can contribute to the already appreciable knowledge about the southern African Middle Stone Age period.

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1: Introduction

The Republic of Botswana, a land-locked country in southern Africa, was until recently a virtually unknown area archaeologically. This must be seen in relation to the earlier view of Botswana as peripheral to archaeological research when compared to the neighbouring countries. As a consequence, archaeology in Botswana was constructed “(...) in the shadow of neighbouring archaeologies” (Lane et al. 1998:16). Only during the 1960s and 70s, did Botswana enter the global spotlight through extensive ethnographic and ethno-archaeological studies of the Kalahari hunter-gatherers (e.g. Bieseke 1993; Hitchcock 1976, 1978; Hitchcock et al. 1977; Lee 1967, 1972, 1979, 2002; Lee & DeVore 1976; Marshall 1957, 1960, 1961, 1976; Silberbauer 1981; Thomas 1958, 1965; Yellen 1971, 1977; Yellen & Brooks 1989; Yellen & Harpending 1972). This early ethnographic research presented an image of the Kalahari hunter-gatherers as “(...) representatives of a way of life that was, until 10.000 years ago, a human universal” (Lee 1979:1). Through the exploration of a *human universal*, an intimate connection between ethnography and archaeology emerged in Botswana (Lane et al. 1998:14).

Reactions to the timeless portrayal of hunter-gatherers followed in the 1980s and 90s, primarily through the writings of Edwin Wilmsen and James Denbow (Denbow 1984; 1986; Denbow & Wilmsen 1986; Wilmsen 1989, 1993; Wilmsen & Denbow 1990). Their responses initiated the long-running “Kalahari debate”, arguing the extent and nature of contact between the Kalahari hunter-gatherers and the outside world, e.g. farmer societies (see Sadr 1997; Kent 2002 for a comprehensive overview of the “Kalahari debate”). In reviewing this ethno-archaeological debate, the archaeologist Karim Sadr (1997) emphasised the need for extensive archaeological research, as the current evidence on this topic was inconclusive and insufficiently published. In an attempt to help resolve the debate, he initiated research in the Metsemotlhaba River valley on the margins of the Kalahari Desert in south-eastern Botswana (Sadr 2002; Sadr & Plug 2001) (figure 1).



Figure 1: Map of Botswana and bordering countries with the location of geographical features and Middle Stone Age sites noted in the text (After: Google Earth [02.08 2010])

Sadr's research in the Metsemotlhaba River valley was the starting point for the recent Berkeley-Botswana Archaeological Project. The project, headed by David Cohen from the University of Berkeley, was initiated in 2003 to excavate and record archaeological sites in the Metsemotlhaba area in south-eastern Botswana. The research, conducted for Cohen's doctorate thesis, sought to investigate the nature of contact between the hunter-gatherers and farmers in south-eastern Botswana. During Cohen's preliminary investigations, a number of archaeological sites were located in the valley. Of these sites, the Botlhano Fela open air site

situated on Thamaga Hill was decided to be further excavated during the 2007 field season (figure 1). The examination of the Botlhano Fela site, identified as a farmer occupation situated close to previously known hunter-gatherer sites, was intended to “allow the observation of the contact situation from both “forager” and “farmer” perspectives (...).” (Cohen 2007:3). However, quite to the astonishment of the excavators, the alleged farmer site produced a far deeper time perspective than initially anticipated. During the eight week long excavation, the levels underneath the anticipated Iron Age (IA) and Later Stone Age (LSA) deposits yielded a substantial amount of material diagnostic of the Middle Stone Age (MSA) period. The lower levels of the site will, hereafter, be termed the MSA levels. Moreover, an LSA burial was found to have been dug into the parts of the MSA levels.

The discovery of the MSA material provided a new aspect to the Berkeley-Botswana Archaeological Project, where the initial focus, as stated, had been on more recent periods. To adequately document and examine the MSA component of the Botlhano Fela site, David Cohen divided the archaeological material of the site for the purpose of two independent studies. The division was based on the excavator's impression of a clear distinction in the site's stratigraphic layers, as well as its integrity. Cohen assumed that there had been virtually no disturbance of the deposit at this site, other than in the area of the burial. Therefore, he focused his research on the upper stratigraphic layers of the site, which is considered to be from the IA and LSA period. Roughly six thousand lithic artefacts, in a large variety of raw materials, make up the assemblage from the MSA levels of the 5m² excavated area – this lithic assemblage was assigned to the present author.

MSA material has never previously been found in a stratified context in south-eastern Botswana; and it is for the most part found as surface scatters (Robbins & Murphy 1998:57). The few stratified MSA sites in Botswana are mainly located in the north-western part of the country, which is also where most of the ethnographic work has been conducted (Campbell 1998:37-38). To include the analysis of the MSA levels at Botlhano Fela site in a larger perspective, a review of the MSA sites in Botswana, in addition to more closely situated MSA sites from the adjacent Limpopo Province in South Africa, will be provided in the following chapter. Hence, the first aim of the thesis will be to discuss the various typological and

technological aspects of the Botlhano Fela MSA lithic assemblage, and relate this collection to the assemblages found at sites in north-western Botswana and the Limpopo Province of South Africa.

A principal question for the previously studied MSA sites in Botswana regards raw material availability – were the raw materials imported or locally acquired? This question in turn contributes to research of behavioural patterns, such as the mobility of MSA peoples and possible exchange networks, as well as being related to technological features (Murphy 1999; Robbins et al. 2000a; Kuman 1989). From even a cursory examination of the Botlhano Fela MSA material, it became evident that the rich lithic deposit suggests a large variety of raw materials were brought to the hill. In correspondence with the mentioned focus for MSA research in Botswana, questions are raised for the source (s) of these raw materials, and for what purpose (s) the materials were transported to the hill. In sum, the main aim of this research is to examine traces of activities evident in the lithic assemblage from the MSA levels of the hilltop site – from the initial raw material procurement, various approaches for detachment, modification and discard.

To address the above questions, the lithic assemblage from the MSA levels of Botlhano Fela will be examined with the application of the *chaîne opératoire* approach (e.g. Dobres 2000; Dobres & Hoffman 1999; Edmonds 1990; Eriksen 2000; Pelegrin 1990). This approach provides a methodological and theoretical framework for examining the structure of specific sequences of action in material, temporal and spatial terms. The *chaîne opératoire* approach is not commonly applied in southern African lithic research, where typological and statistical approaches have been the norm. This particular approach was chosen for the study of the MSA levels at Botlhano Fela, as the preliminary observations suggested that the majority of the lithic assemblage consisted of artefacts from all stages of manufacture, in addition to a variety of raw material types. Despite the disturbance of some units due to the LSA burial, initial investigations indicated that the assemblage from these particular units would still benefit from a *chaîne opératoire* examination, especially as the stratigraphic integrity of the remaining units at the open air site may be determined by the application of this approach. In contrast to statistical and typological approaches, the ultimate object of the *chaîne opératoire*

is to produce evidence that indicates individual behavioural patterns. In the following study, it is anticipated that the application of a *chaîne opératoire* approach to the lithic assemblage from the MSA levels of Botlhano Fela should provide information about the behaviour patterns of the MSA people on this hilltop site. And, ultimately, broaden the knowledge of the MSA record in an archaeologically little known region of Botswana.

Structure of the thesis

Firstly, the following chapter provides an insight to the MSA research in Botswana, as well as research in the adjacent Limpopo area of South Africa. Chapter 3 will give a brief description of the geological and geographical setting of the open air site, Botlhano Fela. Chapter 4 focuses on the excavation methods utilized at the excavation, and includes a brief description of features yielded in the excavation, such as the stratigraphic layers, extension of the excavation and the LSA burial. Chapter 5 is a presentation of the theoretical and methodological background for the *chaîne opératoire* approach, and outlines the advantages of this methodology for interpreting the lithic material. The latter part of the chapter describes the selected methods and procedures used to examine the lithic assemblage. In Chapter 6, the lithic material from the MSA levels of the site are presented, including a comprehensive description of the identified raw materials and various categories of the lithic assemblage, a rendition of the minimum analytical nodules and the refitted lithic artefacts. In Chapter 7, Cohen's interpretations of the lithic assemblage from the IA/LSA levels are briefly detailed and discussed. This is followed by an interpretation of the stratigraphical integrity and post-depositional processes at the site, and the behaviour patterns evident in the lithic assemblage from the MSA levels. Finally, chapter 8 provides a summary and conclusion to the analysis of the lithic assemblage from the MSA levels of the open air hilltop site, Botlhano Fela.

2: Background

The sudden discovery of MSA materials during the course of the Botlhano Fela excavation partially altered the direction of the Berkeley-Botswana Archaeological Project. In order to better understand the MSA component of this site, the following chapter presents research from other stratified MSA sites located in north-western Botswana and in the adjacent Limpopo Province of South Africa. The characteristic features of this period are considered by using examples from the selected MSA sites.

2.1 MSA research in Botswana and the Limpopo Province, South Africa

The southern African MSA period, dating from about 200 000 to 35 000 years ago, was formerly considered as nothing more than a stagnant intermediate before the LSA, but has during the last decades received considerable attention (McBrearty & Brooks 2000:456-457; Robbins & Murphy 1998:57). The accumulating African evidence on the earliest human populations has inspired central debates in archaeology such as the emergence of modern humans (e.g. Ambrose 1998; Bräuer et al. 2004; Hawks et al. 2000; Lahr & Foley 1998; McDougall et al. 2005; Stringer 2000, 2002; Wolpoff et al. 1996, 2001) and questions regarding early human behaviour and cognition (e.g. Bouzouggar et al. 2007; Brooks et al. 1995, 2006; Brown et al. 2009; d'Errico et al. 2003; Henshilwood & Marean 2003; Henshilwood et al. 2001, 2002, 2004; Hovers et al. 2003; Klein 1995; Marean et al. 2004, 2007; McBrearty & Brooks 2000; Minichillo 2005; Mourre et al. 2010; Vanhaeren et al. 2006; Yellen et al. 2005; Wurz & Deacon 2001). The emphasis of this vast attention to African MSA research has focused particularly on the cave and shelter sites on the coast South Africa and Zimbabwe, due to long sequences and well-preserved deposits (McBrearty & Brooks 2000:487; Walker 1998:69). However, a moderate amount of research has also been conducted on this particular period in Botswana, albeit the investigations have been somewhat limited compared to those of the neighbouring nations (Murphy 1999:63; Robbins & Murphy 1998:50). Much of the knowledge in Botswana is predominantly acquired from surface sites with MSA diagnostic artefacts. For instance, surface sites have been described from the Lake Ngami area in the north-western Botswana (Cooke & Paterson 1960a; Wayland 1950), the Nata River delta (Bond & Summers 1954), Kudiakam Pan and Savuti

sites in the north-eastern Botswana (Robbins 1987, 1988), the Lake Dow area and Orapa Diamond Mine in central Botswana (Cooke & Paterson 1960b; Cohen 1974), and the Ranaka and Kanye sites in south-eastern Botswana (Lane 1996) (figure 1).

In contrast, MSA finds in a stratified context have rarely been reported in Botswana (Robbins & Murphy 1998:57). The first MSA site to be excavated in Botswana was the site of #Gi, located near the border between Botswana and Namibia (Kuman 1989:186) (figure 1). This pan site was first discovered in 1968, and excavations were initiated the following year by J. E. Yellen and other members of the ethno-archaeological “Harvard Kalahari Research Project” (Kuman 1989:175; Campbell 1998a:37). The #Gi site (Brooks 1978; Brooks & Yellen 1977; Brooks et al. 1980, 1990; Helgren & Brooks 1983; Kuman 1989), in addition to the Tsodilo Hills sites: White Paintings Shelter (Donahue et al. 2002-2004; Feathers 1997; Murphy 1999; Robbins 1990a; Robbins et al. 2000a) and Rhino Cave (Phillipson 2007; Robbins et al. 1996; Robbins et al. 2000b), are commonly considered to be the main stratified MSA sites of Botswana (figure 1). Consequently, the assemblages from these three sites situated in the north-western section of Kalahari are regarded as reference points for the Stone Age sequence in Botswana.

A few other stratigraphic sites in Botswana are also, in supplement to the three main sites mentioned above, interpreted to have an MSA component. In north-western Botswana, the sites in question are the Depression Shelter situated on the Tsodilo Hills (Robbins 1990b; Robbins & Campbell 1989; Robbins & Murphy 1998) and the open air site of Toteng 3A (Brook et al. 2008; Robbins 1984b; Robbins et al. 1998). However, the MSA association of the assemblages from the lowest layers at the Depression Shelter is considered to be uncertain, and the site will, therefore, not be in the current review (Robbins & Murphy 1998:61). Prior to the excavation of Botlhano Fela on Thamaga Hill, the only reported example of a stratified MSA site in south-eastern Botswana might be attributed to the Thamaga I site (Robbins 1984a, 1986) (figure 2). The excavation of this site yielded artefacts below the LSA levels referred to as “pre-Later Stone Age” by the excavator (Robbins 1986:6). As this ambiguous term reflects, further investigations of these artefacts are necessary before any conclusion can be reached to a possible affinity with the MSA period. Therefore, the closest typological counterparts in Botswana to the Botlhano Fela assemblage are the stratified sites located in the north-western part of the Kalahari.

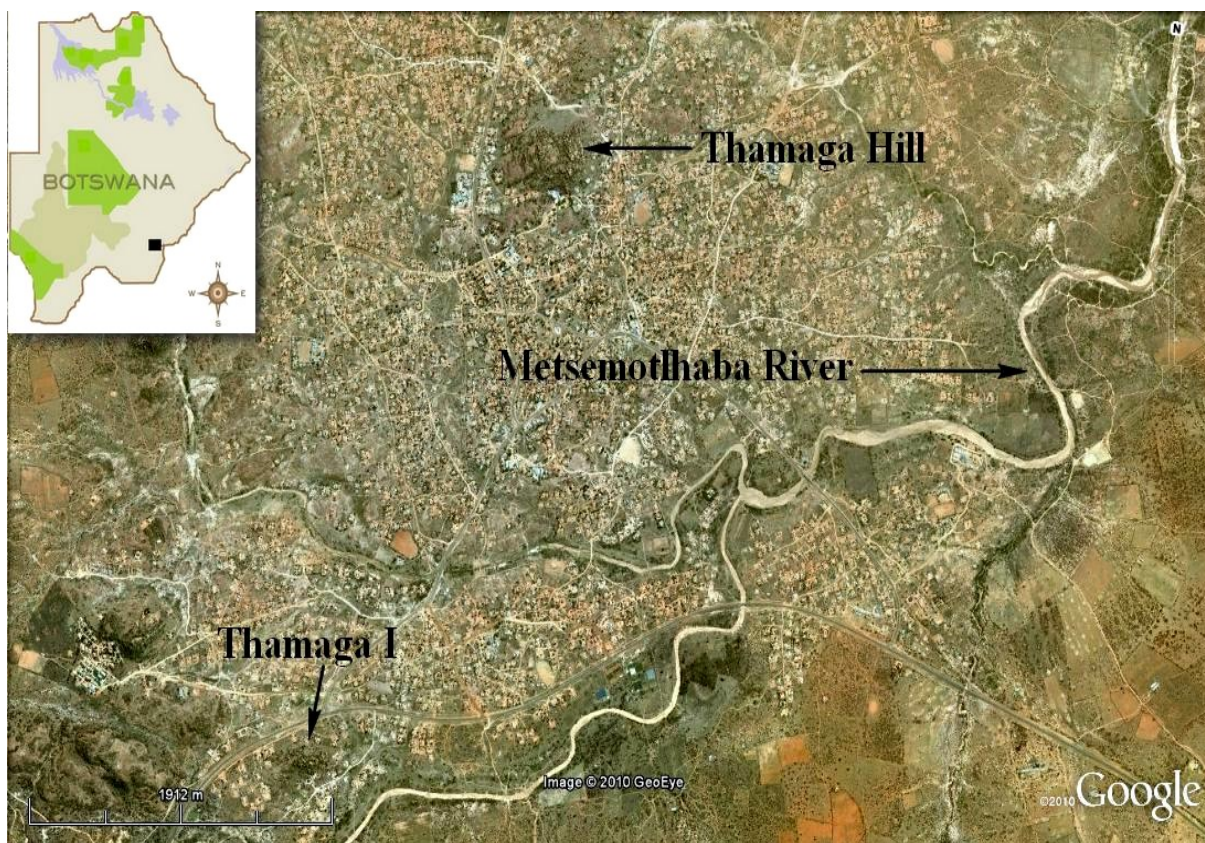


Figure 2: Aerial photo of Metsemotlhaba River valley showing Thamaga Hill, Thamaga I site and the Metsemotlhaba River. The location of the area is marked in the insert map of Botswana (after: Google Earth [01.05 2009]).

In order to set the stage for the study of the MSA levels of the Botlhano Fela site, the following section briefly reviews the main distinctive features of the MSA lithic assemblage from the above-mentioned sites. Additionally, two stratified sites situated in the adjacent Limpopo Province, across the modern border between Botswana and South Africa are represented. The sites are the Cave of Hearths in the Makapansgat Valley (Dart 1948; Mason 1957, 1959, 1969; van Riet Lowe 1954, 1955; Sinclair & McNabb 2005; Tobias 1971) and Kudu Koppie in the Mapungubwe National Park (Kempson 2007; Kuman et al. 2005a; Kuman et al 2005b; Pollarolo et al. 2010; Wilkins et al. 2010) (figure 1).

The Limpopo sites are located closer to the Botlhano Fela site than the sites in north-western Botswana, i.e. roughly half the distance. Moreover, the Limpopo Province and the south-eastern Botswana share a similar environmental and geological setting. The north-western sites of Botswana are located in the environmental region termed the sandveld region of the Kalahari, whereas the Limpopo and south-eastern Botswana sites are in the sandveld region on the fringe of the Kalahari (Lane et al. 1998:23; Murphy 1999:12). Nevertheless, all the selected sites will contribute as sources for local and interregional comparisons to the

Botlhano Fela site. For this comparative purpose, aspects from the MSA sites that are particularly relevant to the current lithic analysis of the Botlhano Fela assemblage will be emphasised. These focal aspects are technological and typological features, in supplement to the various stages of manufacture represented at the sites, particularly emphasising raw material procurement and availability.

2.1.1 The open air site of #Gi

The archaeological excavations of the pan site of #Gi yielded a sequence of LSA materials, an intermediate industry described as containing “blades and few formal tools” and a large MSA assemblage (Brooks et al. 1990:62) (figure 1). The complete MSA assemblage counts over 26 000 artefacts from an excavated area of over 100m² (Kuman 1989:205-206). This sum indicates the immense amount of materials at #Gi, especially given that less than 20% of the MSA deposit is estimated to have been excavated (Helgren & Brooks 1983:193). The well-preserved MSA layers, sealed by calcrete limestone, have been dated from about 65 000 to 85 000 years ago (Helgren & Brooks 1983:186; Brooks et al. 1990:62) (see Table 1).

Ages for the Middle Stone Age levels from dated sites					
Site	Stage	Method	Material	Age range	References
#Gi	intermediate	AAR	Ostrich eggshell	31 010 ± 1100	Brooks et al. 1990
	MSA	AAR	Ostrich eggshell	77 000 ± 11 000	Brooks et al. 1990
White Paintings Shelter	intermediate	TL	Quartz sand	48 000 ± 4800	Robbins et al. 2000a
	MSA (500 cm)	TL	Quartz sand	66 400 ± 6500	Robbins et al. 2000a
	MSA (605 cm)	TL	Quartz sand	94 300 ± 9400	Robbins et al. 2000a
Rhino Cave	MSA	TL	Sediment	18 175 ± 2871*	Robbins et al. 2000b
Toteng	MSA	OSL	Sediment	51 500 ± 7200	Brook et al. 2008

Table 1: Ages for the MSA layers at #Gi, White Paintings Shelter and Toteng. *Robbins et al. (2000b:19) considered the dating from the MSA layers at Rhino Cave to be unreliable.

According to Kuman (1989:258), the lithic assemblage from the MSA layers of #Gi is recognised as a flake industry made predominantly from amorphous and discoidal cores. These particular detachment techniques are reflected in the débitage, which is composed mainly of irregular flakes and flake fragments. Blades are rarely found in this industry, as well as an absence of convergent *Levallois* points in the débitage materials (Kuman 1989:258-259). The proportion of tools make up about 8%, at the MSA levels of #Gi (Kuman 1989:206). The tool assemblage is generally distinguished by the production of a variety of scrapers, perforators, denticulates, various retouched flakes, as well as finely-made bifacially

and unifacially retouched points (Brooks et al. 1980:305). The latter tool type, depicted in illustration 1 in appendix II, is predominant in the \neq Gi tool assemblage. More than 600 bifacial and unifacial points were excavated from the site, and this constitutes about 42% of the retouched tools (Brooks et al. 1990:62; Kuman 1989:61). The dominance of this tool type, together with other traits from \neq Gi, is argued to indicate a possible special-purpose site (Kuman 1989:215). Furthermore, the striking position for the various retouched points is a characteristic feature of the assemblage. Kuman (1989:259-260) determined that a relative high percentage of the points were corner-struck; a particular feature that is attributed to a discoidal working of cores. This feature has been related to intentionally creating an aerodynamic tool-shape, and, therefore, suggesting that the points were used as projectiles (McBrearty & Brooks 2000:483). Kuman (1989:261), however, argues that the feature may in part be explained by unequal wear and curation of a tool. Accordingly, the \neq Gi points were suggested to be highly curated tools that performed several functions: “ (...) perhaps akin to a pocket-knife, that was used in more than one manner.” (Kuman 1989:240).

Further, the high frequency of curated and recycled artefacts, particularly the retouched points and convergent scrapers, in the \neq Gi assemblage indicates that there was a scarcity of good quality raw materials (Helgren & Brooks 1983:193). The \neq Gi industry was made largely on finely-grained chalcedony, while cherts, quartz, silcrete and quartzite were used to a smaller degree (Helgren & Brooks 1983:189; Kuman 1989:192). The potential sources for these raw materials occur within a 100 km radius of the site, but were perhaps not immediately accessible for the MSA people in the area. The specific raw material sources are not known (Kuman 1989:256).

2.1.2 The Tsodilo Hills sites

The Tsodilo Hills is one of the most significant archaeological areas in the Kalahari, and was declared a World Heritage Site in 2001 by UNESCO (Segadika 2010:152). The hills contain over 3500 rock paintings, and has at least one rock shelter and one cave that contains evidence of MSA occupations overlain by IA and LSA levels: White Paintings Shelter and Rhino Cave (Robbins & Murphy 1998:58; Robbins et al. 2000b:17).

White Paintings Shelter

The White Paintings Shelter was named after the numerous white paintings, which depicts various animals and schematic designs, on the shelter wall (Robbins 1990a:2). During the course of the 1989 - 1993 excavations, a total of 31 square meters were excavated with the two deepest units reaching 7 meters down (Murphy 1999:22). The excavated units yielded archaeological deposits spanning the IA and the LSA to the MSA period, and over 32 000 lithic artefacts, including about 3000 tools (Murphy 1999:112). The MSA deposit at the base of the sequence is overlain by a transitional industry, broadly consisting of large blades, scrapers, awls and notched artefacts (Murphy 1999:110). Robbins et al. (2000:1103) state that the layer is comparable to the intermediate layer at \neq Gi dated to about 34 000 years ago.

The subsequent MSA layer is dated to range between 65 - 95 000 years ago, which is also consistent with the dated sequence from \neq Gi (Robbins et al. 2000a:1105) (see Table 1). The MSA deposit at the White Paintings Shelter is marked by a sudden increase in débitage materials, which is further reflected by a corresponding increase in lithic tools (Murphy 1999:159). The tool assemblage is particularly recognised by the production of unifacial and bifacial points, as well as medium to large side- and end-scrapers, denticulates, notched artefacts and awls (Robbins et al. 2000a:1105). Micro-wear examination by Donahue et al. (2002-2004:157) of the bifacial and unifacial points interpreted certain features as impact fractures, possibly resulting from their use as projectile points. However, the researchers state that this interpretation does not eliminate the possibility of some points being used as knives, borers or re-worked into scrapers (Donahue et al. 2002-2004:158).

Besides the retouched tools, several large unretouched blades were uncovered at White Paintings Shelter. In addition, a notable concentration of “triangular flakes with convergent dorsal scars”, also termed *Levallois* points by Murphy, were discovered (1989:215-216). Cores were found to be numerous, and common types were *Levallois*, amorphous, discoidal, bipolar, as well as blade cores (Murphy 1989:160).

Rhino Cave

The site was named after a prominent wall-painting interpreted by Robbins et al. (1996:23) as a white rhinoceros. Opposite of the painting are numerous grooves that have been intentionally ground into the wall. Archaeological research in 1995 and 1996 of four square meters at Rhino Cave uncovered about 1, 50 meter of deposits, spanning the early IA as well

as the LSA and MSA period (Robbins et al. 2000b:17-18). Interestingly, the MSA deposit has been dated to a considerably young date that does not correspond with ages from other MSA sites in Botswana and southern Africa (see Table 1). Robbins et al. (2000b:19) acknowledge several inaccuracies of the TL-sample taken from the site, and they consider, therefore, the age of the MSA layers at Rhino Cave to be uncertain.

Close to 10 000 lithic artefacts were yielded at the site, of which the majority is concentrated in the MSA levels. This assemblage mainly consist of débitage, and only about 3, 5% of the material was recognised as tools (Robbins et al. 2000b:19). Similar to the White Paintings Shelter, the MSA tool assemblage at Rhino Cave is characterised by medium to large end- and side-scrapers, denticulates, notched artefacts, as well as unifacially and bifacially retouched points (Robbins et al. 1996:31-32). A total of 71 points, which were interpreted to be in various stages of manufacture, were recovered (Robbins et al. 2000b:20). Some points were complete, while others appear to be unfinished (i.e. preforms) or abandoned due to knapping errors. The excavators argue that this observation, along with the large amount of débitage, suggests that the tools were manufactured at the site (Robbins et al. 2000b:21). Of special note, several of the points, differing from the White Painting Shelter points, were noted to be corner-struck (Robbins et al. 1996:32). The Rhino Cave points are, therefore, suggested to closely resemble the \neq Gi points (Robbins & Murphy 1998:60). In addition to the retouched artefacts, several large unretouched blades were uncovered in the MSA levels. This corresponds with the large blades found in the MSA deposit of White Paintings Shelter (Robbins et al. 1996:32).

Other similarities between the Rhino Cave and White Paintings Shelter MSA assemblages, is the relatively high frequency of imported raw materials, i.e. chert, jasper, chalcedony and silcrete, in contrast to the more recent LSA assemblages (Robbins & Murphy 1998:60; Robbins et al. 2000a:1105). These raw materials were interpreted to have been initially prepared as cores at sources located outside of the immediate vicinity of the Tsodilo Hills, due to the near absence of cortical or partially cortical flakes in the assemblage (Murphy 1999:208). The imported raw materials were particularly selected for the production of points and other retouched tools, although, some examples of well-made points were manufactured on quartz (Robbins et al. 1996:32; Murphy 1999:235). The MSA occupants at both discussed Tsodilo sites used substantial amounts of quartz and quartzite. However, these materials were more commonly found as débitage (Murphy 1999:235; Robbins et al. 2000a:1095). Quartz

and quartzite blocks are locally available from the Tsodilo Hills themselves. These blocks of materials are hypothesised by Murphy (1999:204) to have been tested at the initial acquisition site. Subsequently, the suitable material was brought to the shelter to be further tested and reduced, as evidenced by the large quantities of “angular waste”.

2.1.3 The open air Toteng site

The Toteng site is located on the upper edge of a modern quarry at the eastern end of Lake Ngami, south-west of the Okavango Delta (Brook et al. 2008:151) (figure 1). The Lake Ngami area is a well-known archaeological region with several excavated LSA sites, as well as surface finds of Acheulean hand-axes and MSA artefacts. This indicates a lengthy occupation of the general area (Cooke 1979:11; Robbins 1984b:1; Robbins et al. 1998:125). Recent investigations of one of the LSA sites, referred to as Toteng 3A by the excavators, yielded a stratigraphic MSA component: Six lithic artefacts were embedded in the wall of the quarry face (Brook et al. 2008). This associated sediment has been OSL dated to approximately 51 000 years ago (Brook et al 2008:155) (see Table 1). Twenty-six additional MSA artefacts from the sloping erosion surface were found immediately below the wall, and Brook et al. (2008:151) consider the majority, or possibly all, of the surface finds to have eroded from the wall containing the embedded lithics.

The six lithic artefacts found in the quarry wall were identified as mostly flakes and flake fragments with no diagnostic features. However, a single amorphous core was suggested to be “ (...) identical to MSA cores found elsewhere in Botswana.” (Brook et al. 2008:156). Several of the twenty-six surface finds were also argued to display MSA features, including another amorphous core, a discoidal core, a large flake with a faceted striking platform and a large flake-blade. In addition to these diagnostic features, the MSA artefacts was found to be of a larger size in comparison to the LSA assemblage from the upper levels of the site. Also, there is an increased use of silcrete in the earlier levels than in the LSA period at the Toteng 3A site (Brook et al. 2008:155).

2.1.4 Scattered MSA sites in Botswana

In supplement to the review of MSA stratified sites in Botswana, the following section provides a brief description of previously mentioned surface sites: The Lake Ngami area, the Nata River delta, Kudiakam Pan and Savuti sites, the Lake Dow area and Orapa Diamond Mine, and the Ranaka and Kanye sites (figure 1). Other MSA surface sites are also known, but little or no information is available for these sites. This demonstrates the problem of a severe lack of available publications, as has been noted by several researchers (e.g. Campbell 1998b: 256-257; Lane et al. 1998:16; van Waarden 2004:148).

The Lake Ngami area in the north-western Botswana, also incorporating the previously mentioned Toteng region, has yielded several surface finds of MSA materials (Wayland 1950; Cooke & Paterson 1960a) (figure 1). Wayland (1950:12) from the Geological Survey Department collected large amounts of Stone Age remains in the area for the purpose of “(...) assessing the range and wealth of the stone age remains in the Protectorate”. Based on this compilation of artefacts, he defined a cultural sequence through time. Here the MSA was characterised by thick, stumpy flakes with steep trimming before reaching a Magosian or similar culture (Wayland 1950:12). The Magosian culture was once considered to be a transitional phase between the MSA and the LSA (Murphy 1999:26). Other surface MSA sites in the Ngami area have been reported by Cooke and Paterson (1960a). The cultural material they collected shows characteristics such as faceted butts, fine bifacial points and discoidal cores. This assemblage was mainly made of locally available silcrete and quartz (Cooke & Paterson 1960a:36).

In the north-eastern part of the country, Bond and Summers (1954) interpreted an open air MSA site on the bank of Nata River to be a hunting camp (figure 1). The small surface assemblage of twenty-eight artefacts includes six well-made bifacial points, four scrapers and one backed blade (Bond & Summers 1954:91). The majority of tools were produced in silcrete, which is a raw material that is not locally found in the area (Bond & Summers 1954:94). Other Stone Age surface sites in the north-eastern region have been located in the Savuti area and Kudiakam Pan (Robbins 1987) (figure 1). While few diagnostic tools were found at Savuti, Robbins (1987:567) interprets the characteristics of the débitage to suggest a MSA or earlier occupation of this area. The débitage includes large unretouched flakes, “(...) irregular corelike pieces (...)”, as well as a few scrapers and miscellaneous retouched pieces (Robbins 1987:567). The survey of the Kudiakam area, close to the large Makgadikgadi Pan,

yielded ten wind-deflated MSA surface sites (Robbins 1987:568). The Kudiakam lithic assemblage is generally characterised by the use of locally available silcrete, as well as amorphous cores, prepared cores together with *Levallois* flakes, denticulates, unifacial and bifacial retouched points (Robbins 1987:568; 1988:41). The débitage materials include many large flakes and blades (Robbins 1987:568).

Cursory investigations of the Orapa Diamond Mine area in central Botswana yielded lithics suggested to belong to a late stage of the MSA (Cohen 1974:1) (figure 1). The Orapa assemblage consisted almost entirely of flakes, scrapers, knives and cores made of silcrete. This raw material occur as outcrops in the adjacent area. Cohen (1974:2) interpreted the site to be a tool manufacture site on account of the large amounts of silcrete débitage in the area. Also in central Botswana, are three surface sites located close to the Makgadikgadi Pans in the Lake Dow area. These sites are interpreted as hunting camps from the MSA period (Cooke & Paterson 1960b) (figure 1). The assemblages from the three sites are similar in composition, and include diagnostic artefacts such as bifacially and unifacially retouched points, discoidal cores and *Levallois* cores (Cooke & Paterson 1960b:122).

In the south-eastern Botswana, archaeological surveys in 1992 located several previously unrecorded Stone Age sites in the area around the modern settlements of Kanye and Ranaka (Lane 1996:21). Three low density scatters of MSA material were discovered in the Ranaka environs, i.e. a hillside site, a site along a stream channel and a MSA scatter site at the base of a hill (Lane 1996:17-18). In the Kanye environs an extensive complex of transitional ESA/MSA lithic scatters was located, where the largest of these scatters is located in an erosion gully (Lane 1996:19).

2.1.5 The Limpopo sites, South Africa

The following section presents two stratified MSA sites from the Limpopo Province of South Africa: the Cave of Hearths and the Kudu Koppie site. The Cave of Hearths in the Makapansgat Valley was first discovered in 1937 by a pioneer of South African Stone Age archaeology, Clarence van Riet Lowe, and a decade later systematic excavations at the cave were initiated by Revil Mason (Tobias 1971:335) (figure 1). The descriptions of the assemblage may, therefore, seem outdated today, but the Cave of Hearths cultural sequence has been used as a standard to which other sites in the Limpopo Province are referred (Mason

1957:120; Daniels 1967:120). The Kudu Koppie site, is, on the other hand, recently excavated as part of an archaeological research programme in the Mapungubwe National Park (Pollarolo et al. 2010; Kuman et al. 2005a; Kuman et al. 2005b; Wilkins et al. 2010) (figure 1).

Cave of Hearths

The Cave of Hearths excavations evidenced a lengthy sequence with several “prehistoric cultural levels that range from the (...) Earlier Stone Age, through all the divisions of the (...) Middle Stone Age, to the climax of the Later Stone Age near the top with protohistoric and historic remains in the uppermost (...) disturbed surface soil.” (van Riet Lowe 1954:27). Of particular interest is the MSA deposit of the cave, initially radiocarbon dated to be about 15 000 years old (Mason 1959:6). However, this dating was later questioned in light of newer evidence, and Mason (1969:59) proposes that “perhaps the Cave of Hearths Bed 4 artefact assemblage is also older than 50 000 B.C.”.

The MSA levels of the site extend over three stages (van Riet Lowe 1955). In the first stage, the earliest MSA inhabitants manufactured convergent points, radial flakes, as well as long flake-blades (Sinclair & McNabb 2005:184). The following occupants employed the *Levallois* technology to make an industry of blades, radial flakes and especially convergent points. A number of unifacially, and sometimes bifacially, retouched points also appear in this intermediate industry. The last of the MSA occupants produced a microlithic industry with backed segments and retouched points (Sinclair & McNabb 2005:184). The material from this final phase of the MSA is considered to be somewhat uncommon for the period, and according to McBrearty and Brooks (2000:499-500) it could, in fact, be attributed to the Howiesons Poort industry or the LSA period. The Howiesons Poort complex has been located in an extensive region of southern Africa, in particular South Africa, but is to date not found in Botswana (McBrearty & Brooks 2000:500).

Locally available raw materials were almost exclusively used for the majority of tool production. A large part of the tool assemblage consist of quartzite, andesites and cherts, which are available both from primary contexts within one kilometre of the cave and also in the form of cobbles from the local riverbanks (Sinclair & McNabb 2005:188 - 189). The retouched points, however, are made from a variety of raw materials, including hornfels, felsites and fine grey cherts that do not seem to be available in the local area (Sinclair & McNabb 2005:188 - 189).

Kudu Koppie

Archaeological survey of the Mapungubwe Valley was initiated in 2001 as part of a Stone Age research programme, initially focussing on the Early Stone Age (ESA) of the area (Kuman et al. 2005a:164). Three sites were located, of which the open air site of Kudu Koppie evidenced a cultural sequence extending from the ESA, through the MSA and up to two phases of the LSA and IA (Kuman et al. 2005a:170-172) (figure 1). A total of 10 square meters of the Kudu Koppie site has been excavated to date, yielding a rich site with up to 21 000 lithic artefacts recovered per square meter (Wilkins et al. 2010:1281). The concentration of artefacts in the two lower units near the bedrock surface is high, and is interpreted as being the result of both deflation and frequent occupation of the site over time (Kuman et al. 2005a:174). Despite the deflated deposit, a refitting analysis of the assemblage conducted by Pollarolo et al. (2010) demonstrated that the stratigraphic integrity is fairly well-preserved.

The sealed MSA deposit of Kudu Koppie is characterised by an emphasis on the prepared core technique for production of flakes, and diagnostic artefacts includes *Levallois* cores, bifacially retouched points and other prepared flakes (Kuman et al. 2005b:27; Pollarolo et al. 2010:157). Denticulates, denticulated scrapers, large segments and numerous flakes are also present in this deposit (Kuman 2005a:172). The sample of tools constitutes only about 1, 9 % of the lithic assemblage in the MSA levels at Kudu Koppie (Wilkins et al. 2010:1282). Kempson (2007:32) interprets the abundance of flaking débitage in the deposit to indicate a regular use of the site for tool manufacture, and that the raw materials were transported to the site rather than complete tools being brought in and merely re-sharpened.

The occurrence of core reduction on site is further supported by a refitting analysis, in addition to the presence of all stages of lithic manufacture in the assemblage (Pollarolo et al. 2010:159). The most notable core types in the Kudu assemblage are the *Levallois* cores and blade cores. The latter type was made exclusively on fine-grained raw material, while both quartzite and fine-grained raw materials are utilised in the production of *Levallois* cores (Kempson 2007:52). Generally, the MSA deposit is differing from the ESA levels by an increased use of fine-grained raw materials (Kempson 2007:84). Altogether, the MSA assemblage is produced on a diversity of raw material types. Quartzite makes up the largest component, but there are also substantial amounts of quartz, rhyolite and cryptocrystalline material in the assemblage (Kempson 2007:75). These lithic resources are abundant in the region, easily located as cobbles in slopes and trenches, and provided the toolmakers a ready

source of raw materials (Kuman et al 2005b). Other raw materials, i.e. dolerite and banded ironstone, are used in a lesser extent, possibly due to the limited distribution in the area near Kudu Koppie (Pollarolo et al. 2010:153; Wilkins 2010:1281).

Summary;

The MSA period in south-east Botswana is poorly understood for several reasons. There are few well-excavated stratified sites, and the majority of MSA sites are surface scatters commonly found adjacent ancient river systems and pans. Furthermore, the stratified MSA sites are mainly located in the north-western part of the country, where also most of the ethno-archaeological research has been concentrated. The sites in question are #Gi, the Tsodilo Hills sites of White Paintings Shelter and Rhino Cave, as well as Toteng 3A, which recently revealed a small MSA component. Two sites in the adjacent Limpopo Province were included in the review, i.e. Cave of Hearths and Kudu Koppie, as they are located closer and share a similar geological and environmental setting as the Botlhano Fela site.

General features of the MSA assemblages from the above sites are:

- There are several multicomponent MSA sites:
#Gi and White Paintings Shelter consisted of an intermediate and a main MSA layer. The Cave of Hearths MSA sequence extends over three phases.
- Raw material procurement:
The majority of assemblages from several of the surface sites, including the Kudu Koppie and Cave of Hearths, are made of locally available raw materials. At #Gi, there is a high frequency of curated and recycled raw materials. This is probably due to the scarcity of available sources in the vicinity of the site. The White Paintings Shelter and Rhino Cave assemblages are made of locally available materials, which were brought to the site as blocks with little or no initial cleaning and expediently used, while imported raw materials were probably initially prepared at the source before being transported to the shelter. A characteristic for several sites was the relative high usage of imported raw materials for the production of tools, whereas locally available raw materials were utilised for more expedient purposes.
- Initial and middle stages of manufacture:
Prepared core techniques for lithic detachment, such as discoidal and *Levallois*, are commonly found at the majority of sites. Amorphous, blade and bipolar cores were also found.

- Modification:
Bifacially and/or unifacially retouched points are represented at most of the sites, also at the surface sites. Corner-struck points, which reflects the use of the discoidal technique, were particularly noted at #Gi and Rhino Cave. Other common tool types are denticulates, *Levallois* points, a variety of scrapers, awls, perforators, notched artefacts etc.

The characteristics of the MSA assemblages from sites in north-western Botswana and the Limpopo Province in South Africa provide a background for the analysis of the lithic material, as described in this thesis, from the MSA levels of the Botlhano Fela site.

3: Environmental and geological setting

The following chapter presents the modern day geographic region and geological setting of the Botlhano Fela site. This will give indications to processes that potentially have affected the deposition and condition of the archaeological assemblage. Additionally, the description of the setting for the site will give an idea of the physical context and potential raw material sources for the prehistoric people who occupied the area.

The Botlhano Fela site is situated in the Metsemotlhaba River valley on the south-eastern fringe of the Kalahari Desert. The valley lies about 40 kilometres off the edge of the Kalahari sand cover. The semi-arid to arid desert covers about 70 % of Botswana, and makes up the largest sand sea on earth (Thomas & Shaw 1991:9). The Kalahari Desert is notable for the lack of permanent water, however, it is a well vegetated desert comprising largely of a range of savannah types such as grass and shrub (Thomas & Shaw 1991:12). The Thamaga area receives 500-550 mm of rain annually, which sustains a tree and bush savannah with a mixture of broad-leaf trees, as well as acacia plants (Sadr 2002:30).



Figure 3: View of Thamaga Hill (Photo: Cohen 2007)

The Botlhano Fela site, a Setswana name meaning "only five", is located at 1104 meters above sea level on top of Thamaga Hill (pers. comm. David Cohen 2008). The surrounding, plain area is situated at an elevation of about 1000 meters, making the hill a noticeably visible feature in the landscape (figure 3 & 4).

Thamaga Hill is the largest of a group of small hills by present-day Thamaga village, comprised of mainly granite formed from volcanic uplifting (Key 1982). Along the edge of the village runs the Metsemotlhaba River, meaning "sandy water" in Setswana, giving name to the surrounding Metsemotlhaba River valley (figure 2). As the name alludes, the river is an ephemeral sand-bed watercourse,

forming part of the Limpopo network (Hassan et al. 1999:625). All the major watercourses in the region are ephemeral with extensive deposits of sand and minerals. In the bends of the Metsemotlhaba river, the sand deposits contain abundant deposits of pebbles and cobbles of the various rocks found in the area (Hassan et al. 1999:623; Key 1983:181). A detailed description of the geology of the area confirms the existence of sedimentary rocks (e.g. limestone, chalcedonies, agate, jasper), metamorphic (e.g. quartzites) and igneous rocks (e.g. feldspar, quartz) (Cairncross 2004; Key 1982, 1983).

The basement rocks of the south-eastern part of Botswana are known as the Pre-Cambrian Gaborone Complex (pers.comm. Prof. Bernard W. Vink, Geology Department at University of Botswana, 2008). The Complex comprise a number of rock types which are all similar in composition, but differ in textures. The core is Thamaga Granite that consists of rapakivi granite with micro-granite sheets (Key 1982). Other rock types are the medium-grained Kgale Granite, Nthlantlhe Micro-granite and Kanye Volcanics (Key 1982, 1983:2). Minerals present in these rock types are: quartz, K-feldspar, felsic plagioclase, very little micas, and minor traces of hematite (pers.comm. Prof. Bernard Vink, 2008).

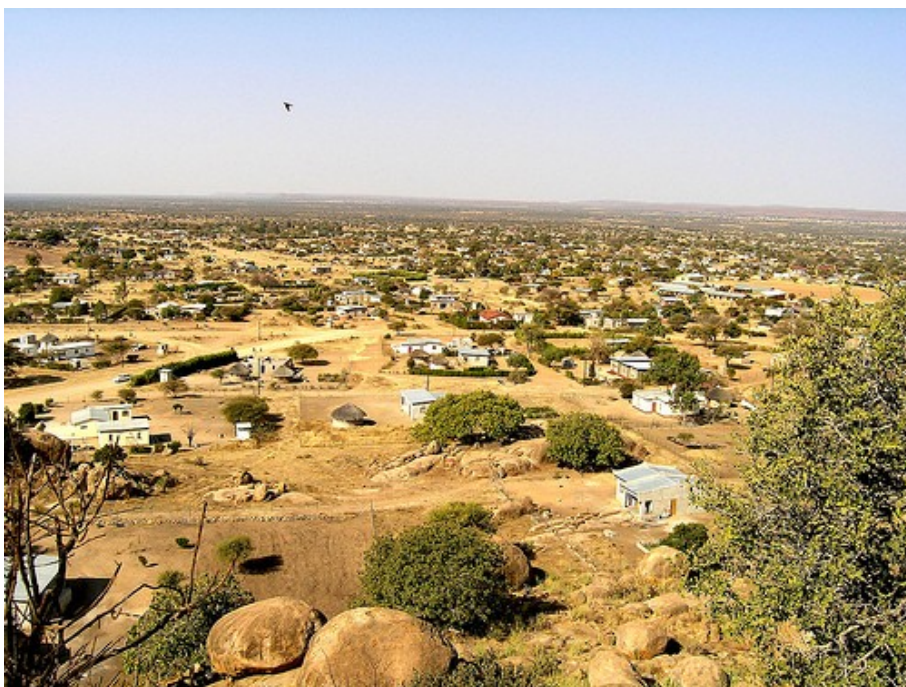


Figure 4: View of Thamaga village and surrounding area from Thamaga Hill (Photo: Cohen 2007)

The basement rocks are locally covered by sediments of the Waterberg-, Ventersdorp- and the Transvaal Supergroup (Key 1983). The minerals in the Waterberg Supergroup are almost only quartz with minor hematite. The main rock types of Ventersdorp are volcanics and siltstones.

The Transvaal Supergroup consists of minerals such as limestone, quartz, quartzite, hematite, shales and chert breccias (pers.comm. Prof. Bernard Vink, 2008; Key 1982). The above description of the geological setting of the south-eastern part of Botswana correlates to identified raw material types in the Botlhano Fela assemblage, which will be presented in Chapter 6.1 Raw materials.

Summary;

The Metsemotlhaba River valley, where the Botlhano Fela site is located, is in near vicinity of the semi-arid to arid Kalahari Desert. The surrounding landscape is flat, making Thamaga Hill a protruding feature in the area. The hill is the largest of a group of hills by Thamaga village, and is comprised of mainly granite. Along the village runs the ephemeral Metsemotlhaba River with deposits of abundant pebbles and cobbles of various local rocks. The geological setting of the landscape includes sedimentary, metamorphic and igneous rocks. The assessment of the geology of the surrounding area gives an idea of the availability of various raw material types, which could have been potential sources for the prehistoric people at Botlhano Fela.

4: The excavations of Botlhano Fela

The following pages will, at first, briefly outline the excavation methods utilised at the Botlhano Fela site. Subsequently, the identified stratigraphical layers of the site will be described. These were referred to by David Cohen as Zone 101, 102 and 103. Lastly, the extension of deposit and levels in stratigraphic Zone 103 of Operation 2, the excavated area in focus for the current thesis, is reviewed (figure 5).

4.1 Excavation methods

The excavation of the Botlhano Fela site, located on top of Thamaga hill, commenced in 2004 with a test unit of 1 m². This excavated area is referred to as Operation 1 by Cohen (figure 5). The excavator assumed the site to have been occupied by farmers based on surface structures such as stone circles and -walls, as well as materials from the 2004 test excavation (Cohen 2007:3). Three years later an expansion of the alleged farmer site was initiated to supply a larger sample of materials (Cohen 2007:2). In 2007, three more areas, referred to as Operation 2, 3 and 4, were excavated during an eight week period in the final stage of the Berkeley-Botswana Archaeological Project (figure 5). A total of 13 units of 1 m² were dug over an area of approximately 500 m² on Thamaga Hill. The units from the five excavated areas of Botlhano Fela serve to show the spatial extent of deposit at the site.

The excavations in 2007 utilized the same grid set up in 2004, and mapped the surface area into units with the use of a total station (Cohen 2007:8). Each unit was dug in arbitrary spits of 5 cm descending in numbers from level 1 to the end of level 26 in the deepest excavated unit. During the course of excavation, the material and features from each level was recorded with a standardised excavation form. Moreover, all excavated sediment was screened through a 1/8 inch (= 0,3 cm) mesh. The three-dimensional position of all materials over 2 cm and other particular features of the site was measured with a total station.

BOTLHANO FELA

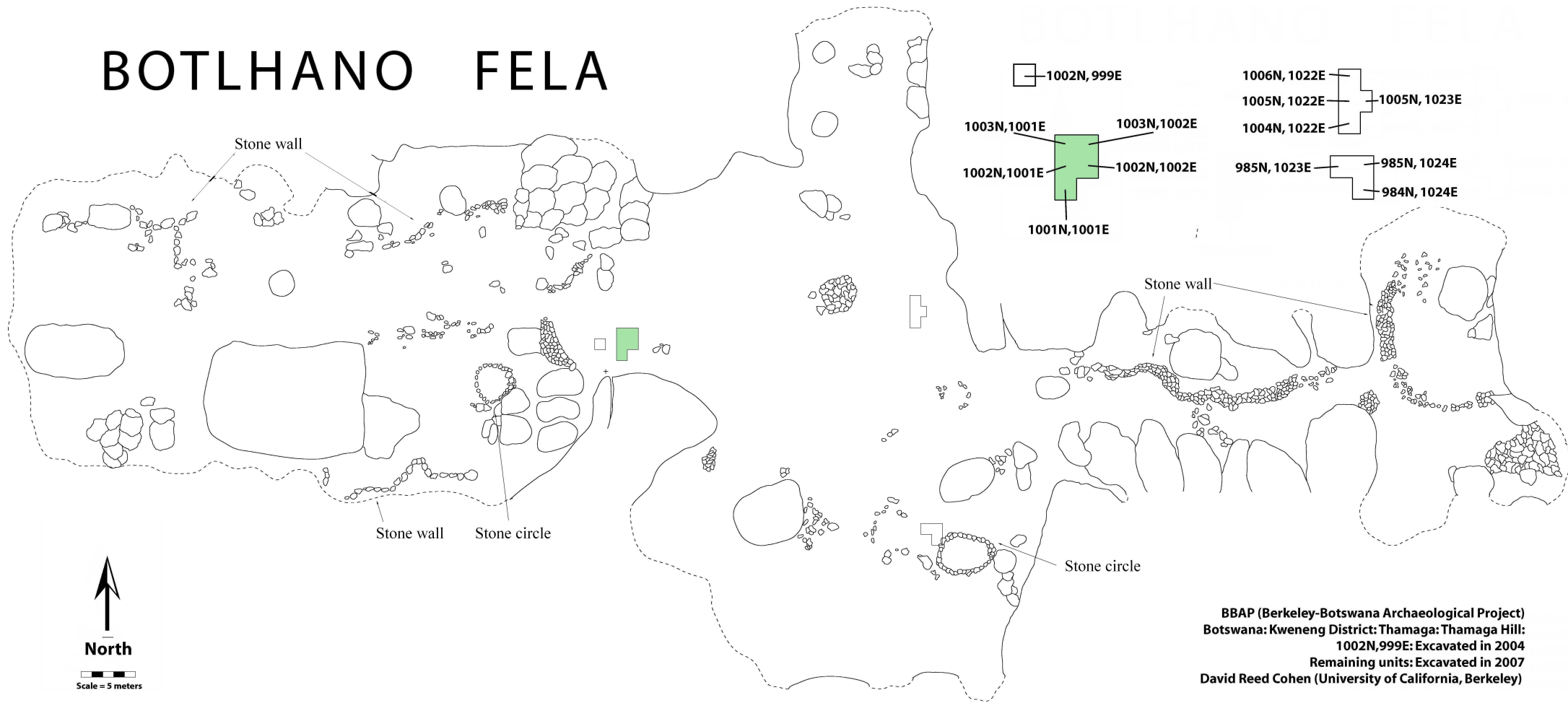


Figure 5: Plan of the Botlhano Fela area showing surface structures and the four excavations, Operation 1-4. Operation 2 (in pink) is the area used in this study. Remaining areas, Operation 1, 3 and 4 are indicated in dark blue (Figure: Cohen 2008; Modified by: Myrer 2010)

4.2 Stratigraphic layers

In distinguishing stratigraphic layers, changes in colour-, texture- and composition of the sediment was documented during the excavations (Cohen 2007:9). A Munsell soil chart was used to identify the colour of all sedimentary deposits. The excavators established three distinct layers on basis of the test unit excavated in 2004. These stratigraphic layers were re-identified during the 2007 excavations, and were designated Zone 101, 102 and 103 (figure 6).

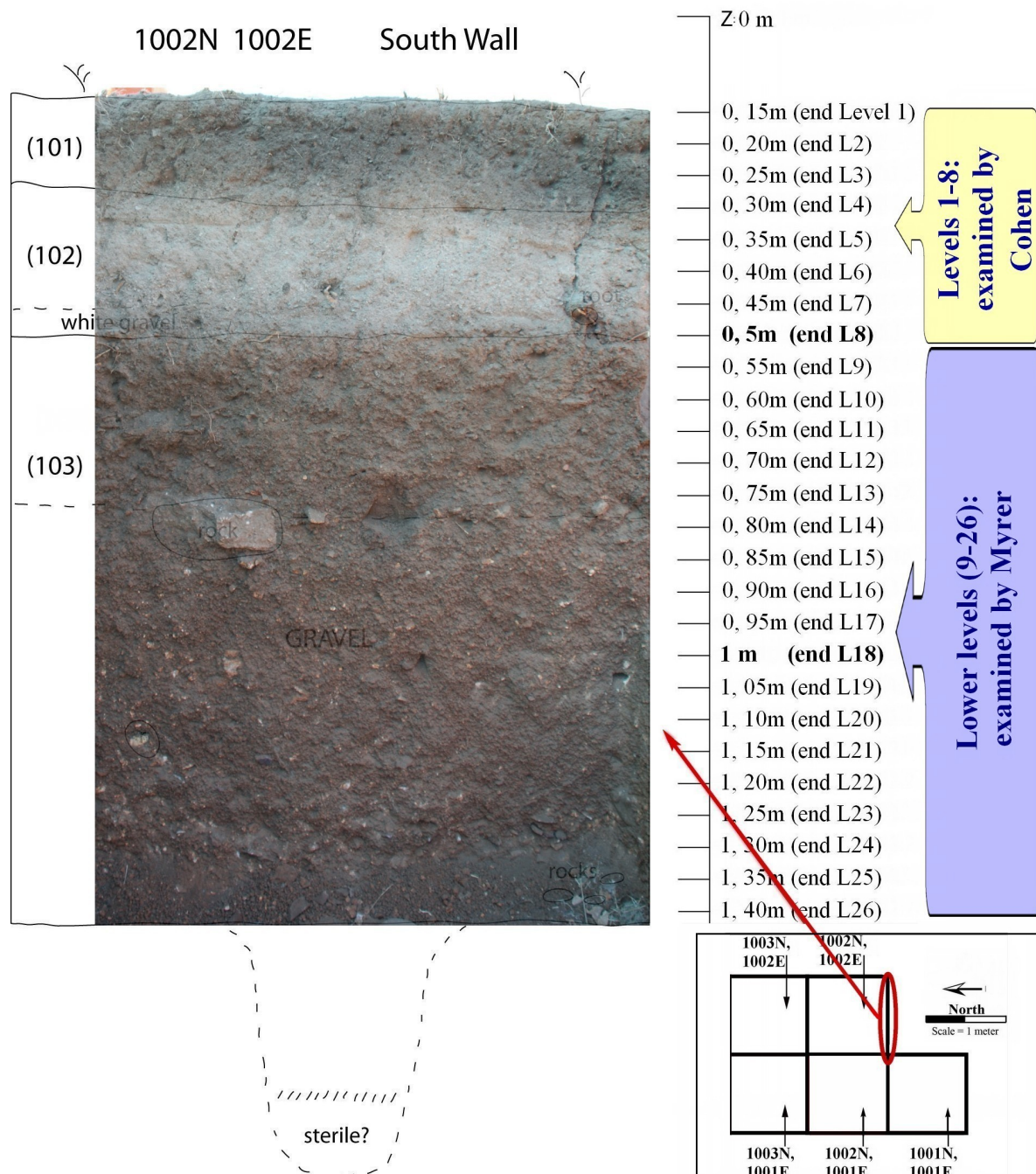


Figure 6: Image depicting the stratigraphical layers and related levels at Bothano Fela from the south wall profile of unit 1002N 1002E in Operation 2. The upper stratigraphic layers are the focus for Cohen's analysis, and the lower layer for the present thesis. A small test pit dug at the bottom of the unit determined the vertical extension of cultural deposits (Photo & wall drawing: Cohen 2007; Edit: Myrer 2009).

- The uppermost stratigraphic Zone 101 consists of the surface and deposit just below the surface. The deposit is very loose and consists of finely-grained sediment, which Cohen (pers. comm. 2008) determined to Munsell colour 10 YR 3/2.
- The middle stratigraphic Zone 102 is a fine-grained sediment, which is specified by Cohen to Munsell colour 10 YR 5/3. During the excavation a few concentrations of white gravel were noted in this deposit.
- The lowest stratigraphic Zone 103 is a very fine-grained and compacted sediment, which is determined by Cohen to Munsell colour 5 YR 4/3. In the lowest levels of this zone, the excavators detected high concentrations of small, reddish brown gravel and larger rocks. In contrast to the two upper stratigraphic zones, the lowest zone contained no other cultural finds than lithic material.

The presence of the three stratigraphic zones were not documented in all of the four excavated areas, i.e. Operation 1 - 4. According to Cohen (2009:12-13), deposit from the lowest Zone could not be verified in Operation 3. This was due to the occurrence of the two burials found in Zone 102, which consequently discontinued further excavation of this area. The burials from Operation 3 were later found to be contemporary with the LSA burial from Operation 2 (pers. comm. Cohen 2008). In Operation 4, just the two upper stratigraphical zones could be determined, as the excavators encountered sterile deposits early in this area. Only Operation 1 and 2 contained deposit from all three stratigraphic zones.

4.3 Operation 2

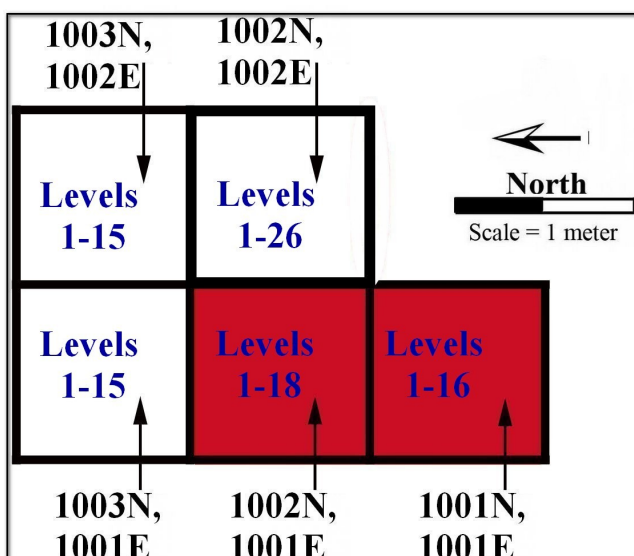


Figure 7: Overview of the five excavated units in Operation 2 at Botlhano Fela illustrating the varying depths of excavation. The excavators encountered a burial at the base of the two units indicated in red (Figure: Myrer 2010).

The distinction between the three above-described stratigraphic layers gave impetus for Cohen to separate the assemblage from Operation 2 for the purpose of two independent studies (indicated pink in figure 5). The lithic material from Zone 103 in these five units, make up the material basis for the current lithic analysis (figure 6 & 7). The Zone 103 from Operation 2 has been termed the MSA levels in the current thesis, whereas the upper zones, i.e. 101 and 102, are termed the IA/LSA levels.

The vertical extension of excavated deposit in each of the five units in Operation 2 varied greatly. As seen from figure 7, the units were excavated ranging from 0, 85 meters (i.e. end of Level 15) up to 1, 4 meters (i.e. end of Level 26). A test pit was dug from the base of the deepest excavated unit, and suggests that cultural deposits end at approximately 1, 70 meter depth as the rest of the soils downwards seemed sterile (figure 6).

In addition to the surprising discovery of diagnostic MSA materials in this zone, a burial was found at the basal levels of the two south-western units (indicated red in figure 7). The burial was exposed first at the beginning of level 13 of the two units, and here the digging continued to a depth of 1, 14 meter. Profile- and surface drawings from the 2007 excavation documents a pit feature in the overlying levels leading down to the burial. This observation infers that the burial was dug into the MSA levels of the site, and, therefore, of a more recent period than the surrounding deposit. The burial was later radiocarbon dated to 356 ± 40 BP, confirming a more recent time for the feature than the surrounding deposit (Cohen pers. comm. 2008). Cohen assumed the stratigraphical integrity of the Botlthano Fela site to be pristine on account of clearly defined layers, except for the area above the LSA burial in Operation 2. Due to the presence of the burial, the deposit from the two affected units would be mixed. In light of this, the materials from the two disturbed units and the remaining three undisturbed units necessitate a separated analysis for the current thesis, as the nature of the deposit has implications for a *chaîne opératoire* examination.

Summary;

The Botlthano Fela excavations were carried out as part of the Berkeley-Botswana Archaeological Project (BBAP). The excavations of the site were initiated with a test pit dug in 2004 (Operation 1), and extended in 2007 with three more areas (Operation 2, 3 and 4). Three distinct stratigraphic layers were distinguished during excavation. However, the presence of these stratigraphic layers could not be established in all of the excavated areas. The three layers were identified in Operation 2, which consists of five units excavated to varying depths. The MSA levels of Operation 2 is the area in focus for the current thesis. A test pit in the deepest excavated unit suggested that the cultural deposit in this area end at 1, 70 meter depth. An LSA burial was yielded at the basal levels of two adjacent units in Operation 2, and was evidenced to have been dug into the MSA levels of this area. This feature would obviously have mixed the sediments in the area, and caused a disturbance of the archaeological record of the two affected units.

5: Reconstructing past behaviour – *chaîne opératoire*

The *chaîne opératoire* is the theoretical framework and methodological approach that has been selected here to study the lithic material from the MSA levels of Operation 2 at Botlhano Fela. This chapter will provide a definition of the approach, and aspects of this method applied to analyse the lithic assemblage. The second part of the chapter will elucidate on the procedure of the lithic analysis – from the initial cleaning and sorting of the lithic assemblage to the final refitting of lithic artefacts.

The *chaîne opératoire* approach is not commonly used in southern Africa, but there are several specific features of the Botlhano Fela lithic assemblage attesting to the suitability of this approach. Firstly, the assemblage consists of a wide variety of raw materials, in a range of different colours, and in a variety of granularity and other easily distinguishable features (see 6.1 Raw materials). This simplifies the separation of the assemblage into raw materials, and, ultimately, the grouping of raw material into nodules for further refitting. Another aspect of the assemblage is the relative low percentage of tools (see 6.2.3 Tools). The main bulk of lithic material is débitage from various stages of manufacture, which in contrast to traditional lithic analysis methods will be included and analysed through a *chaîne opératoire* approach. Moreover, the selected approach can evaluate the possibility of intermixing between the layers. The LSA burial at the basal of two units have obviously caused disturbance of layers in this area. However, the stratigraphical integrity of the remaining units needs to be examined, as the argument for dividing the lithic assemblage rests on Cohen's assumption of a relatively undisturbed stratigraphy.

5.1 The theoretical and methodological framework

The *chaîne opératoire* approach is a theoretical and methodological framework for analysing lithic assemblages (Dobres & Hoffman 1999:2; Dobres 2000:29; Edmonds 1990:57; Inizian et al. 1999:14). *Chaîne opératoire* essentially incorporates an in-depth “reading” of the operations or stages involved in the dynamic process of an artefact’s life - from the acquisition of raw material, manufacture, use and reuse to the eventual discard of the artefact and its incorporation into the archaeological record (Eriksen 2000:75; Inizian et al. 1999:14; Pelegrin 1990:116).

The concept originate from the work of the French archaeologist André Leroi-Gourhan (Inizian et al. 1999:14; Pelegrin 1990:116), and is now a common research method in Europe for studying lithic assemblages. In southern African archaeology it has only recently emerged the last decade

(e.g. Conard et al. 2004; Soriano et al. 2007; Villa et al. 2005; Wurz 1997, 1999, 2000, 2002; Wurz & Van Peer 2006). However, in Botswana, the typological approach is still most commonly used when studying lithic material. The purpose of the typological approach is to classify and determine objects in space and time (Gorodzov 1933:101), and gives prominence to the final artefact – the tool. Contrary to this object-oriented research method, the *chaîne opératoire* approach takes the full range of lithic production into account, from débitage to tools. Hence increasing the potentially valuable information gained from analysing the entire assemblage. Ultimately, the focus of the approach is not on the material itself, but the central objective is to identify the maker's behaviour as seen through the recurring patterns observed in the lithic material. Thus, the reconstruction of a *chaîne opératoire* is a theoretical framework, as an understanding of both tangible and intangible aspects of the past are attempted through recognition of choices made by the artisan (Dobres 2000:166; Edmonds 1990:57). Whilst the production of lithic tools takes place within broad physical and mechanical constraints, the artisan is nevertheless capable of implementing a number of different strategies to create a particular artefact (Edmonds 1990:57). *Per se*, the attention is moved from the artefact to the artisan, or more correctly, to the human agency in the act of material production (Dobres & Hoffman 1999:103).

The artisan's choice of raw materials, knapping techniques, skills, production errors, and reason for abandonment strategies are amongst the many aspects which can be “read” through a *chaîne opératoire* examination. This in-depth “reading” of each stage of an artefact's life forms a general framework consisting of a number of methods. Components of the methodological practice are an identification of raw material, recognition of knapping techniques and methods, technological classification, determining types of blanks and types of tools, subsequent modifications and so forth (Pelegri 1990:116). Such methods are chosen on the basis of the particular research question being examined (Dobres 2000:166), thus, the *chaîne opératoire* approach is simply providing a framework for research. There is not one definite approach to follow, as the methods utilized needs to be reassessed for each unique research question. The applied methods for an in-depth analysis of the lithic assemblage of Botlhano Fela are as follows: identification and provenance studies of the lithic raw material, technological reading of each artefact, and, ultimately, aggregate analyses.

5.1.1 Identification of raw material

The production of artefacts takes place within broad physical and mechanical constraints. The quality, form and relative availability of raw material in the given prehistoric period must therefore

be considered before any assumption concerning the nature of choices is made (Cahen & Van Noten 1971:211; Inizian et al. 1999:99-100; Pelegrin 1990:120). The selection of raw material is based on the mechanical properties of the rocks. The favoured raw material for tool production would have the “qualities of very small or microscopic grain size and smooth texture, are very hard and brittle, and are uniform and homogeneous” (Andrefsky 2007:41). In conjunction with examining the quality of raw material, the surface conditions of the artefacts such as staining, degradation including features as thermal alteration (evident by crazed surfaces, cracking, “orange peel”, pot-lids and colour change) will be recorded (Luedtke 1992:94). An examination of these features could lead to an understanding of the depositional environment of the site.

An identification of raw materials in the assemblage will give an overview of the different raw materials utilized at the site, and provides a basis to address questions of a technological character. For example to consider the relation between technological strategies and the relative availability of raw materials through provenance studies.

5.1.2 Provenance studies of raw material

Raw materials belong to a geological context, and an analysis of this context may reveal not only economic systems, but also behavioural patterns. Identifying potential raw material sources can deduce group movements and behaviour patterns evident of a certain planning depth, as indicated by sources in the vicinity of the site or by those that are not as accessible (Dobres & Hoffman 1999:100; Villa et al. 2005:400). In other words, the raw material in the assemblage can be considered to be of local, regional or exotic origin. Thus, the amount of labour required for the procurement of a particular raw material is recognized. The geological setting can be extensively examined with several geochemical techniques (Andrefsky 2007:43 - 46), or on a more general basis, as conducted for this thesis, by the means of examining geological maps of the relevant area.

5.1.3 Technological reading of artefacts

A dynamic technological reading of each artefact, whether it be tool or waste, is conducted to assess its position within the *chaîne opératoire* (Inizian et al. 1999:16). This will be accomplished by recognizing and describing features of the knapped products: flakes, débitage, and types of tools and cores. Particular emphasis will be given to categorisation of tools and cores. The categories of lithic artefacts will be described according to type of raw material in order to consider the association of particular raw materials and lithic artefacts.

5.1.4 Aggregate analyses – minimum analytical nodules and refitting

Further subdivisions of the identified raw material types will be made through the application of the aggregate analysis methods: Minimum analytical nodule analysis and refitting. Aggregate analyses are methods which stratify an assemblage using non-technological criteria, before considering the technology of the assemblage (Larson 2004:5; Larson & Finley 2004:95). Minimum analytical nodule analysis subdivides the archaeological assemblage into theoretical nodule groups of associated lithics by distinguishing shared features such as colour, texture, inclusions and cortex (Andrefsky 2007:141; Hall 2004:140; Larson 2004:8). As such, lithics within each minimum analytical nodule group can be argued with great probability to have originated from the same piece of parent material. However, it is important to acknowledge that raw materials could have a highly variable appearance, which complicates the interpretation of the material (i.e. degraded material, thermal alteration, staining, or colour changes within the nodule).

The minimum analytical analysis constitutes as a complementary approach to refitting in lithic analysis, particularly where there have not been made a large number of refits. This kind of approach can provide information that would not have been obtainable if only refits were taken into account. By examining the minimum analytical nodule groups, information about stages of production, number of cores brought into or utilized at a site, and the stratigraphical integrity of the site can be obtained (Larson & Ingbar 1992:153). Refitting of lithic material is attempted within the lithic material of a minimum analytical nodule group. The application of the refitting method is a reassembly or a reversal of various lithic artefacts that have been knapped from the same block (Bodu et al. 1987:144; Cahen et al. 1979:663). Refits provide unquestionable association between lithic objects in a production sequence or the occurrence of fracture. Intrinsically, refitted material can be used to assess the validity of minimum analytical nodule classifications. This is of particular concern if the classification of a nodule is uncertain due to lithic material of highly variable appearance.

Along with the distribution of minimum analytical nodules, the refitted material will be used to examine stages of manufacture sequence and to determine the relation between materials in a stratigraphical layer (Bollong 1994; Hofman 1986:691, 1992:1; Larson & Ingbar 1992:151; Villa 1982; Villa et al. 2005). An interpretation of behavioural patterns on a site is conducted by identifying the presence or absence of stages of a *chaîne opératoire* at the site. For example a low frequency of flakes with remnants of outer weathered surface in an assemblage suggests that initial

knapping was done elsewhere. It is necessary to take into account that the refitted sample usually will only constitute a part of the total assemblage for the reasons of sampling and because items of the same assemblage will be made, transported, lost or discarded at a number of locations.

5.2 Procedure for the lithic analysis

During the excavation of the Botlhano Fela site, the lithic material had been separated into individual find-bags with information of the unit, level and stratigraphic zone the objects were located in. The lithic material was further analysed throughout six months in 2007/2008 at the Iziko Museum in Cape Town, South Africa.

In preparation for a *chaîne opératoire* analysis of the lithic material, all objects were cleaned using water and a soft brush. The sediment covering the artefacts made it in some cases problematic to determine features such as colour, raw materials or retouching. A number of the lithics were also covered by a hardened soil, which was impossible to remove with water and brush, but alternative methods were not employed as these would be more intensive. Although it could prove more difficult to observe the complete surface of the affected lithics, they were still included in the lithic analysis. Following the cleaning of the lithic assemblage, lithics above 1, 5 cm were labelled in order to be recorded and sorted individually. Each lithic object was marked with an ID-code, which was written with a 0, 1 mm waterproof pen, and sealed with clear nail polish. The unique ID-code consists of the abbreviation of the site name, “BF”, and a running number, e.g. “BF4021”. Over 6000 lithic objects were labelled.

The recorded lithics (except the lithic objects < 1, 5 cm, and occasional non-lithic objects) were photographed for each separate level and unit in order to establish a photographic database of all the lithic objects. Additional macro-photographs of selected lithic artefacts, such as cores, tools and refits, were taken to provide a detailed depiction of certain features. Subsequently, the selected artefacts were illustrated in a style that would give impressions of depth (i.e. shading), and following symbols and conventions to convey information about the technology of an artefact (Martingell & Saville 1988). The illustrations of the lithic artefacts complements the macro-photographs, as the wide range of raw materials and other attributes are best depicted in photography.

An MS Access database was established to record variables for each lithic object such as unit, level, type, raw material, amount of outer surface and comments (see Appendix V). Variables for the lithic objects classified as tools and cores were recorded in separate database tables. The lithics were recorded and classified on the basis of definitions set by Kuman (1989) and Murphy (1999). Various raw materials in the assemblage were identified with assistance from Herbert Klinger, curator at the National History department at Iziko Museum. Characteristics of the raw material such as granularity, colours, staining, outer weathered surface and thermal alteration were also recorded in the database.

The lithic material was initially grouped according to level and unit to provide an overview of the total assemblage. The material was further assembled into a single collection in preparation for a minimum analytical analysis and the refitting method. The scope of material to be analysed was narrowed down, because of time-limitations. Consequently, lithics of coarse quartz were excluded, as well as raw material in a heavy degraded state, and of a coarser texture, which could prove difficult to distinguish. Raw materials with easily distinguishable characteristics were further subdivided into thirteen minimum analytical nodules. These were named in alphabetical order from “Group A” to “Group M”. A description of each minimum analytical nodule can be found in Appendix IV. Finally, refitting of lithic material within the thirteen identified nodules was attempted, and the successful results were photographed and recorded.

Summary;

The theoretical and methodological framework of the *chaîne opératoire* approach is applicable for an in-depth study of the lithic assemblage and the questions at hand. The *chaîne opératoire* approach provides more than just a description of artefacts. It is particularly suitable to provide an understanding of the technical, social and economic dimensions where the artefacts were made and given meaning. This is accomplished by a set of methods to interpret the sequence of procedures performed by the knapper – from the initial procurement of raw material, preparation of the cobble, basic production of blanks and detachments, production of tools, use and reuse to the final abandonment of artefacts. The *chaîne opératoire* is, thus, both a conceptual framework where material and immaterial dimensions are connected, and an analytical methodology where the *chaîne opératoire* of an artefact is determined. The applied methods that will be used in this study are an identification of the utilised raw material and the potential sources, a technological reading of the lithic artefacts, and the aggregate analyses: minimum analytical nodule analysis and refitting.

The procedure of the lithic analysis of the Botlhano Fela MSA lithic assemblage was conducted at the Iziko Museum in Cape Town, South Africa. Firstly, the lithic assemblage was cleaned, and labelled with a unique ID-code consisting of the abbreviated site-name and a running number. All lithic artefacts were photographed according to level and unit. An MS Access database was created to record features of the lithic material. Selected artefacts were illustrated and macro-photographed. Ultimately, a sample of the lithic material was sorted into thirteen minimum analytical nodule groups named “Group A” to “Group M”. Refitting of was attempted within the lithic material of these groups, and the proven refits were also recorded and photographed.

6: Presentation of the lithic assemblage

A total of 6180 lithic artefacts from the MSA levels of Operation 2 at Botlhano Fela, weighing about 39 kilograms, were recorded and analysed for the current thesis (table 2). As previously mentioned, the stratigraphical integrity of the site was assumed to be well-preserved by the excavator except for the two units affected by the LSA burial (figure 7). Therefore, the lithic assemblage from the disturbed and the remaining three undisturbed units will be presented separately. The lithic assemblage, introduced in the following pages, comprises of a description of identified raw material types, and the different categories of lithic assemblage grouped according to related raw materials. The classification of artefacts is, in supplement to the *chaîne opératoire* analysis, conducted to facilitate an understanding of the Botlhano Fela lithic assemblage. Moreover, the classified artefacts will be related to the MSA lithic assemblages from the north-western Botswana and the Limpopo Province in South Africa. Lastly, the results of the minimum analytical nodule analysis and refitting examination are presented.

MSA levels of Botlhano Fela																
Type/ Level	Undisturbed units							Disturbed units							Operation 2	
	Debris	Flake	Tool	Core	Other/ Undet.	Total	%	Debris	Flake	Tool	Core	Other/ Undet.	Total	%	Total	%
L9	40	63	1	0	5	109	2%	22	50	2	3	5	82	7%	191	9%
L10	159	199	2	6	13	379	8%	29	49	3	3	2	86	7%	465	15%
L11	212	286	8	13	5	524	11%	31	39	1	1	3	75	6%	599	17%
L12	173	187	5	1	12	378	8%	82	50	1	5	5	143	11%	521	19%
L13	126	168	0	4	4	302	6%	35	53	4	5	4	101	8%	403	14%
L14	59	83	2	6	5	155	3%	89	138	4	3	23	257	21%	412	24%
L15	74	83	5	1	8	171	3%	24	32	0	6	5	67	5%	238	9%
L16	19	32	1	2	1	55	1%	24	33	0	1	1	59	5%	114	6%
L17	61	74	0	1	12	148	3%	18	40	1	0	6	65	5%	213	8%
L18	30	42	1	3	4	80	2%	0	0	0	0	0	0	0%	80	2%
L19	45	56	3	1	1	106	2%	0	0	0	0	0	0	0%	106	2%
L20	64	120	3	1	2	190	4%	0	0	0	0	0	0	0%	190	4%
L21	260	326	10	8	15	619	13%	0	0	0	0	0	0	0%	619	13%
L22	271	242	8	7	14	542	11%	0	0	0	0	0	0	0%	542	11%
L23	259	244	7	11	10	531	11%	0	0	0	0	0	0	0%	531	11%
L24	300	306	8	16	11	641	13%	0	0	0	0	0	0	0%	641	13%
Burial	0	0	0	0	0	0	0%	140	156	1	13	5	315	25%	315	25%
Total	2152	2511	64	81	122	4930	100%	494	640	17	40	59	1250	100%	6180	100%
%	44%	51%	1%	2%	2%	100%	-	40%	51%	1%	3%	5%	100%	-	100%	-

Table 2: Overview of the lithic assemblage from the MSA levels of Operation 2, Botlhano Fela. The assemblage has been separated according to the likely undisturbed units and disturbed units. Total amount in all five units of Operation 2 is presented in the far right section of the table (Table: Myrer 2010)

The above table illustrates the densely concentrated MSA levels of Operation 2. The undisturbed deposit comprise of an average of about 1644 lithic artefacts per square meter. The relatively dense amounts of materials corresponds with the significant increase in the number of lithics from the upper IA and LSA levels to the MSA levels in this area as noted by the excavators. The vertical distribution of lithic artefacts is fairly similar throughout the MSA levels, with a slight increase in the levels 10 - 13 and 21 - 24 in the undisturbed area, as well as in level 14 and in the burial-area of the disturbed units. However, as the units were dug to various levels, this is a partial representation of the told excavated area (figure 7). Most units were excavated up to and including Level 15, while deepest excavated unit was dug to Level 24. In this unit, we clearly see an exponential rise in the concentration of lithics towards the lowest excavation levels (figure 8). This particular aspect of the assemblage will be further elucidated in Chapter 7.2.1 – Stratigraphical integrity and post-depositional processes at Botlhano Fela.

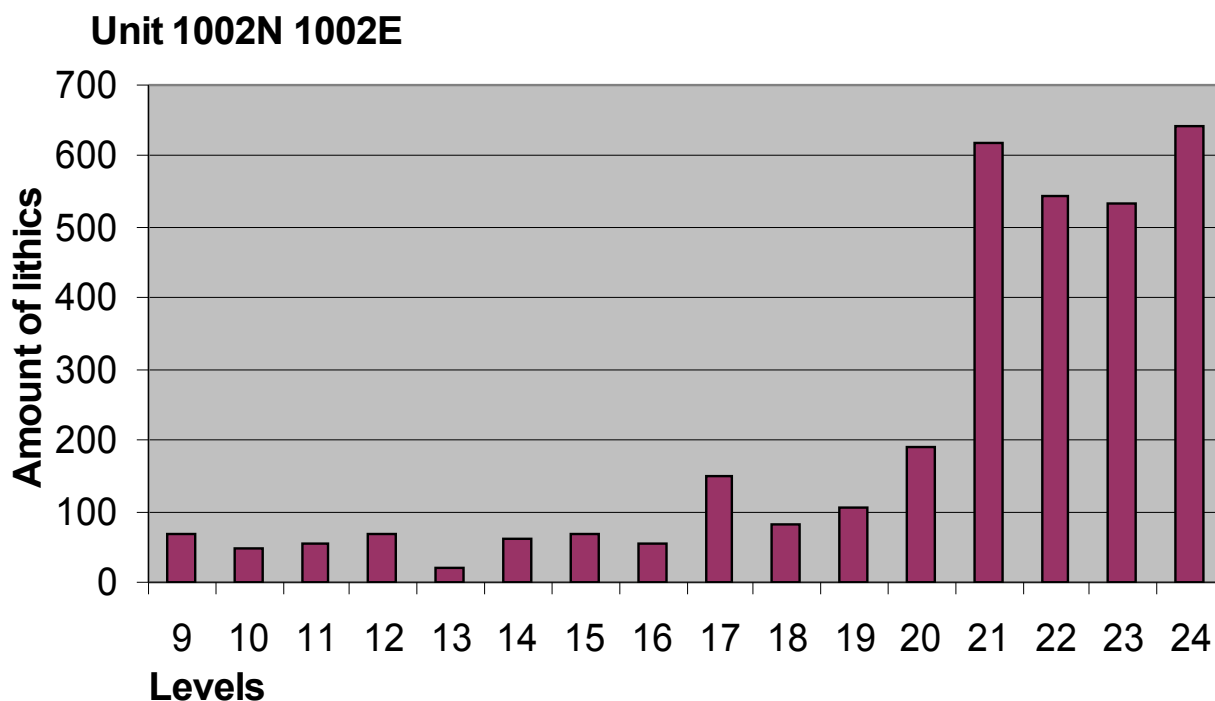


Figure 8: Amount of lithics (n=3302) from Level 9 to 24 in Unit 1002N 1002E at Botlhano Fela (Figure: Myrer 2009)

6.1 Raw materials

The Botlhano Fela lithic assemblage contains a wide range of raw materials which have been classified into quartz, quartzite, jasper, agate, and chalcedony. Nevertheless, these classifications are open to interpretation, as some raw materials are heterogeneous in composition and can, thus, grade into each other. The raw materials quartz, jasper, agate and chalcedony are compositionally identical silicates, and are characterised by specific qualities favoured for tool production. However,

quartz is crystalline in form, in contrast to the cryptocrystalline raw materials of jasper, agate and chalcedony which are uniformly isotropic (Cairncross 2004:170-184). Not easily identifiable raw material or minor amounts of a particular raw material were sorted as “other/undetermined”. Fully degraded lithics could not be classified to a specific raw material, and were, accordingly, sorted as “degraded”. This left a collection of 5445 readily identifiable materials. Particular emphasis was given to features such as colour, granularity, staining, thermal alteration and outer weathered surface, as lithic material with shared characteristics determined further subdivision into minimum analytical nodules.

Raw materials						
Types	Undisturbed units		Disturbed units		Operation 2	
	Amount	%	Amount	%	Amount	%
Quartz	1813	37%	424	34%	2237	36%
Quartzite	1052	21%	265	21%	1317	21%
Agate	970	20%	264	21%	1234	20%
Jasper	400	8%	89	7%	489	8%
Chalcedony	140	3%	28	2%	168	3%
Degraded	395	8%	96	8%	491	8%
Other/ Undetermined	161	3%	83	6%	244	4%
Total	4931	100%	1249	100%	6180	100%

Table 3: Overview of amount of identified raw material types (n=6180) according to undisturbed and disturbed units from the MSA levels of Operation 2, Botlhano Fela (Table: Myrer 2010)

6.1.1 Quartz

Quartz is the most abundant raw material (n= 2237) in the analysed lithic assemblage from Operation 2 at Botlhano Fela (table 3). The proportion of this raw material, as well as the other identified raw materials, is fairly similar in both the undisturbed and disturbed units. Quartz occurs in many varieties in the assemblage, from the most common type of opaque white milky quartz to a few specimens of translucent rock crystal quartz, pink rose quartz and grey smoky quartz. The granularity of quartz ranges from finely-grained to coarser-grained material. Two variants of outer surface was observed in the quartz assemblage: a rounded, smooth outer surface, and an angular outer surface. Several specimens of quartz were noted to have red-orange veins. This characteristic might be indicative of burning (Ballin 2008:51). However, not much research has been conducted on the subject to give conclusive evidence of the quartz assemblage as being thermally altered.

6.1.2 Quartzite

The second largest raw material group (n= 1317) in the assemblage is quartzite, which is a metamorphosed sandstone with a high crystallised quartz content (Cairncross 2004:264) (table 3). The quartzite material from Botlhano Fela varies greatly in colours from red, yellow, tan to grey, and in granularity from very coarse to finely-grained material. The outer weathered surface of the quartzite material was noted to be smooth and rounded. A few quartzite specimens have features such as crazing and duller surfaces indicating an exposure to heat (Luedtke 1992:94).

6.1.3 Cryptocrystalline raw materials

Agate, jasper and chalcedony have been classified as cryptocrystalline materials, which constitutes the second largest raw material category (n=1891) in the Botlhano Fela assemblage. The specific raw materials will, however, be presented separately in the following section.

Agate constitutes about 20% (n= 1234) of the lithic material from the MSA levels at Botlhano Fela (table 3). The agate assemblage is highly variable in appearance with a wide range of colours, different patterns and inclusions. A smooth and rounded outer weathered surface were noted for the agate material. Several specimens appear to have been burnt, as they have features such as “orange peel” and crazing. A few specimens have an opaque white rind, which indicates staining from the surrounding alkaline soil (Luedtke 1992:100).

Jasper constitutes about 8 % (n= 489) of the entire lithic assemblage from the MSA levels of the site (table 3). The lithic pieces range in appearance from homogeneous red, to “ironstone” and in conglomerates with agate and quartz. The “ironstone” variety is recognised by a banded formation of jasper and chert (Cairncross 2004:181). The bulk of jasper have a finely-grained quality, while a few specimens were noted to contain inclusions of crystal and other impurities. Specimens have a rounded, almost polished, outer weathered surface. A few pieces have developed a black, yellow or opaque white rind, which is likely to have been caused by staining from the surrounding soil. Some specimens also have features indicating exposure to heat such as pot-lid fractures, and “orange peel” surfaces (Luedtke 1992:100).

Chalcedony makes up about 3 % (n= 168) of the analysed lithic assemblage from the MSA levels of Botlhano Fela (table 3). It is found in varying lucidity from opaque to transparent, and in shades of white and grey frequently containing dark impurities. The main bulk of material is heavily burnt

showing crazing and colour alteration. Additionally, much of the chalcedony have been partly degraded to a porous, yellow dark-spotted chalcedony.

6.1.4 Degraded material

Fully degraded lithic material makes up about 8 % (n= 491) of the total lithic assemblage from the MSA levels of Botlhano Fela (table 3). General features of degraded material are the porous, brittle quality and the grey to beige colour. Not all specimens were fully degraded, but would contain features indicating varying degrees of degradation. Partly degraded specimens where the raw material could yet be recognized would be classified to the original raw material (e.g. as the previously described porous chalcedony). Although not quantified, the total amount of partly degraded lithic material together with the fully degraded material accounts for a significant amount of the total lithic assemblage.

6.1.5 Other/Undetermined

Raw materials which were not easily identified or consisted of minor amounts in the Botlhano Fela assemblage, were grouped to the “other/undetermined”-category. This category constitutes about 4% (n= 244) of the total amount of lithics (table 3). A majority of the lithics in this group have a greyish, matte appearance, which was termed to be a sort of metamorphic raw material (pers. comm. Prof. Herbert Klinger, National History Department of Iziko Museum, 2007). Other notable raw materials varieties in this category were identified to be ochre and petrified wood. The ochre, a hematite with a metallic lustre, pieces in the assemblage occurs as less than 2 cm pebbles or fragmented pieces. No in-depth studies were conducted on ochre for this thesis as the material did not appear to have been knapped. A single artefact of petrified wood was recognised in the MSA assemblage. In southern Africa petrified wood is found on the surface in widely scattered areas. Over an extensive period of time, the organic material in wood is replaced by silica - a process which literally turns trees into stone (Macintosh 1976:57).

6.2 Categories of the lithic assemblage

The following pages provide a broad description of lithic categories that is useful for discussion of the MSA in southern Botswana, as no excavated MSA assemblage in this area has yet been described in detail. For this reason, diagnostic artefacts will be determined with reference to the other previously described MSA sites in other regions of Botswana and Limpopo Province of South Africa. The identified diagnostic features in the Botlhano Fela assemblage will further be utilised to examine the initial assumption of the lower deposit as belonging to the MSA period. The lithic artefacts were categorised with terminology commonly utilised in Botswana set by Kuman (1989) and Murphy (1999). The classification and description of the lithic artefacts are presented according to raw material. The débitage was, thus, subdivided into categories of flakes, chips, micro-blades, knapping fragments, preforms and debris. The rest of the lithic assemblage was classified as either cores or tools of various types. Shattered material and manuports were categorised as “other/undetermined”.

6.2.1 Débitage

A greater part of the lithic material, more than 90 % of the assemblage, consists of residual material from various stages of the lithic reduction process (table 2). The débitage assemblage includes flakes and various debris material (e.g. chips, micro-blades, crested blades and preforms). Débitage materials smaller than 1, 5 cm were excluded from the lithic analysis. The micro-blades (n=3) were found both in the disturbed and undisturbed units of the site, and are commonly associated with LSA technologies (Murphy 1999:52).

Table 4 illustrates the proportions of raw material types in the débitage assemblage for the undisturbed and disturbed units, and evidences relatively similar proportions of débitage and raw material types in the various units. Considering the whole assemblage from the MSA levels, the most commonly found raw material is quartz, followed by the amount of cryptocrystalline raw materials: agate, jasper and chalcedony. In contrast to the other raw materials, quartz constitute a high proportion of debris when compared to flakes. The commonly found variety milky-quartz produces a large volume of shattered fragments when struck, and, therefore, constitutes to over half of the total lithic debris. Also, the flake characteristics (i.e. conchoidal fracture patterns) which determine if material has been struck are notoriously difficult to observe in milky-quartz. For this reason, it can be problematic to separate the quartz assemblage into different stages of the *chaîne opératoire*.

Débitage											
Raw material/ Débitage	Undisturbed units				Disturbed units				Operation 2		
	Flakes	Debris	Total	%	Flakes	Debris	Total	%	Total	%	
	Quartz	549	1202	1751	38%	143	278	421	37%	2172	37%
	Quartzite	632	361	993	21%	157	83	240	21%	1233	21%
	Agate	639	287	926	20%	176	65	241	21%	1167	20%
	Jasper	257	120	377	8%	60	17	77	7%	454	8%
	Chalcedony	101	34	135	3%	19	9	28	2%	163	3%
	Degr.	264	106	370	8%	55	32	87	8%	457	8%
	Other/ Undetermined	69	42	111	2%	30	10	40	4%	151	3%
	Total	2511	2152	4663	100%	640	494	1134	100%	5797	100%
%	54%	46%	100%	-	56%	44%	-	-	100%	-	

Table 4: Overview of the débitage assemblage (n=5797) according to the undisturbed and disturbed units from the MSA levels of Operation 2, Botlhano Fela (Table: Myrer 2010)

6.2.2 Cores

Cores or fragment of cores make up about 2 % of the total lithic assemblage, and the proportion is fairly similar in the disturbed and undisturbed units (table 2). These were further divided into four main types representing different technological approaches for detachments: amorphous cores, single platform cores, *Levallois* cores and discoidal cores. Cores in a very degraded or fragmented state were classified as “other/undetermined”. Variables such as amount of outer weathered surface, number of removals larger than 10 mm, and maximum length and width were recorded. The maximum length of a core was measured as maximum dimension in any direction, and the maximum width was measured as perpendicular to the length.

Cores																
Core type/ Raw material	Undisturbed units								Disturbed units							
	*Am.	S.p.	Le.	Di.	O./U.	Total	%	Am.	S.p.	Le.	Di.	O./U.	Total	%	Total	%
Quartz	7	12	0	1	3	23	28%	7	3	1	0	2	13	33%	36	30%
Quartzite	5	12	2	1	1	21	26%	5	0	3	0	3	11	28%	32	26%
Agate	8	3	2	0	1	14	17%	2	1	4	0	1	8	20%	22	18%
Jasper	5	1	7	0	1	14	17%	2	1	0	0	0	3	8%	17	14%
Chalcedony	1	0	0	0	0	1	1%	0	0	0	0	0	0	0%	1	1%
Degraded	0	2	2	0	0	4	5%	2	0	0	0	0	2	5%	6	5%
Other/ Undetermined	1	2	0	1	0	4	5%	3	0	0	0	0	3	8%	7	6%
Total	27	32	13	3	6	81	100%	21	5	8	0	6	40	100%	121	100%
%	33%	40%	16%	4%	7%	100%	-	53%	13%	20%	0%	15%	100%	-	100%	-

Table 5: Overview of the core assemblage (n=121) according to undisturbed and disturbed units from the MSA levels of Operation 2, Botlhano Fela. * Am.=Amorphous core, S.p.= Single Platform, Le.=Levallois core, Di.=Discoidal core, O./U.= Other/Undetermined (Table: Myrer 2010)

Amorphous cores

The most common core type in the total Botlhano Fela assemblage is the amorphous core (table 5). This type is defined by three or more striking platforms oriented on different planes, and have been used for the production of flakes (figure 9: d). Amorphous cores are frequently found at MSA sites, for example at #Gi, Toteng and several of the scattered MSA sites in Botswana (Kuman 1989:258; Brooks 2008:156; Robbins 1987:568). The core type is, however, not diagnostic for any particular Stone Age period. At the White Paintings Shelter, the amorphous core is one of the most common types found at the LSA, intermediate, as well as the MSA levels (Murphy 1999: 191-192). The amorphous cores at the MSA levels of Botlhano Fela were found in all varieties of raw material, and most predominantly in cryptocrystalline raw materials. Notably, this is the only core type in the examined assemblage which was found in chalcedony. The abandoned amorphous cores are generally small to medium sized, with a mean length of 4 cm and 2 cm in width (see Table IV in Appendix VI). The number of negative removals is commonly high, with up to sixteen remaining removal scars for a single specimen. In average, there is little outer weathered surface left on the core.

Single platform cores

Single platform cores are defined by one major platform in which detachments were struck in one direction (figure 9: c). Table 5 indicate that a significant amount of this core type was found in the undisturbed units (40%) compared to the disturbed units (13%). The single platform reduction technology was utilised for the production of both flakes and micro-blades, of which the latter is more typical for the LSA and Early IA period (Robbins et al. 2000a:1098). The single platform cores at Botlhano Fela were found in most raw materials, but were particularly common in quartz and quartzite. The mean size of the exhausted cores was measured to 4 cm in length and 2 cm in width (see Table IV in Appendix VI). The number of scar removals is generally high in number, with as much as fourteen removal scars identified on a single core. All cores have no or modest remnants of outer weathered surface. A number of abandoned cores have knapping errors, for example an acute angle of removal, stepped, hinged and plunged scar removals.

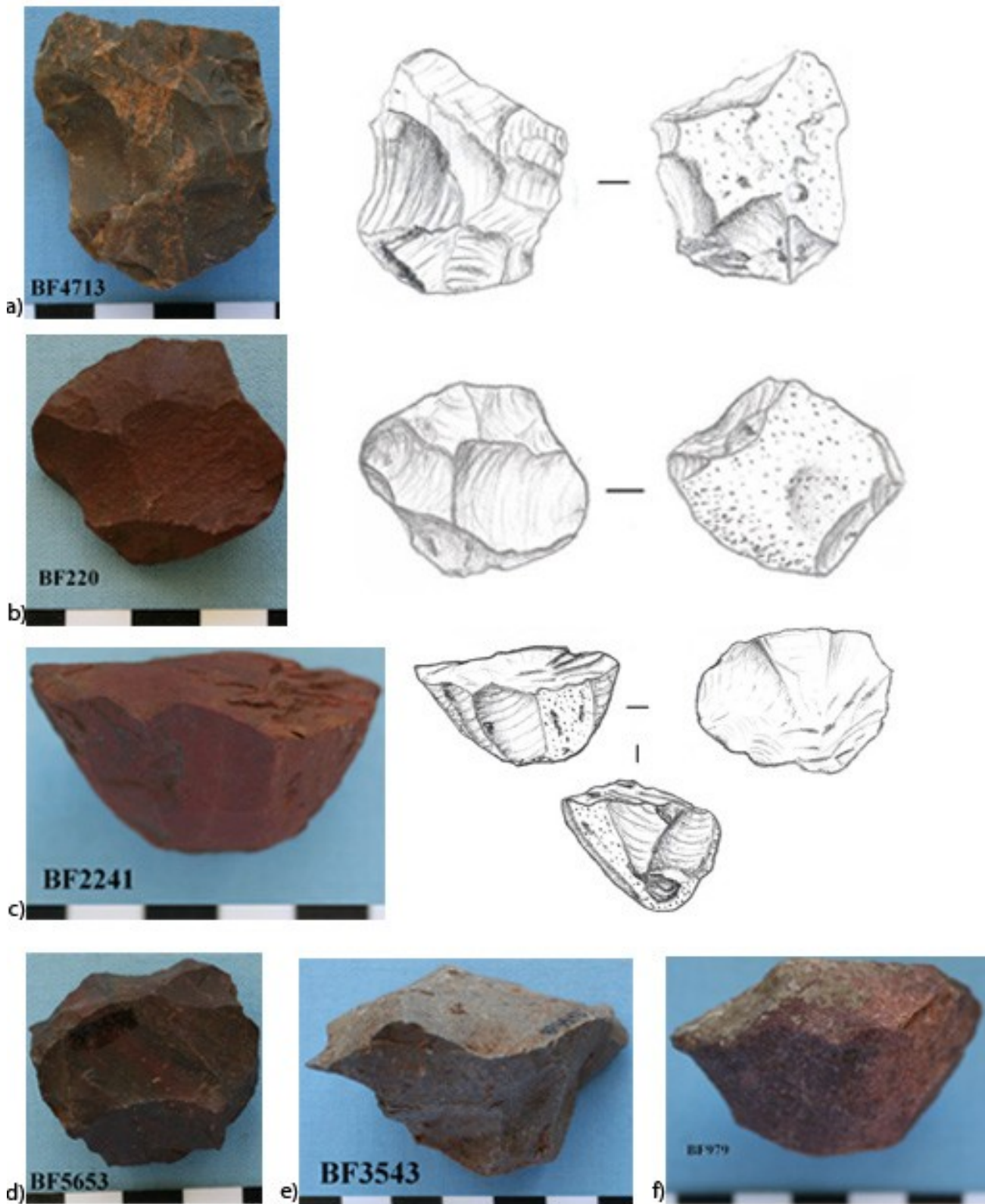
Levallois cores

Levallois cores, also referred to as prepared cores, and are diagnostic of the MSA period (figure 9: a,b). Comparable artefacts were for example yielded at the MSA levels of White Paintings Shelter at Tsodilo Hills (Murphy 1999:160; Robbins et al. 2000a:1105), as well as in the Limpopo sites of Kudu Koppie and Cave of Hearths (Sinclair & McNabb 2005:184; Kuman et al. 2005b:27). In the

Botlhano Fela assemblage, *Levallois* cores were found in all varieties of raw material except chalcedony. The mean length of the abandoned cores was measured to 5 cm and width to 1, 5 cm (see Table IV in Appendix VI). Several knapping errors were also observed for *Levallois* cores, for example the hinged removal on an agate core (figure 9: a). The number of removals for this type of core is somewhat higher in comparison to the former-described core types. Up to nineteen removals were counted on a single *Levallois* core. Several of these cores have an extensively utilized surface with two faces of detachments, i.e. the production and platform surface. The cores appear to have been detached with the recurrent method, where a series of removals were detached on the production surface. The recurrent method contrasts the linear method, which allows for the removal of a single flake carrying off the majority of the production surface (Chazan 1997:725).

Discoidal cores

Three discoidal cores were identified in the undisturbed units of the Botlhano Fela site (figure 9: e, f). This core type is a definitive marker for the MSA period, and is comparable to artefacts found at for example #Gi (Brooks & Yellen 1977:26; Kuman 1989:259) and White Paintings Shelter (Murphy 1999:160; Robbins et al. 2000a:1105). The mean length of the few Botlhano Fela specimens was measured to 4, 5 cm, and mean width to 2 cm (see Table IV in Appendix VI). Negative removals were counted to between nine and eleven, and the abandoned cores have little or no remnants of outer weathered surface. The discoidal cores were found in the raw materials quartz, quartzite and finely-grained metamorphic rock (table 5).



6.2.3 Tools

Tools and tool fragments make up just over 1 % of the total lithic assemblage from the MSA levels of Botlhano Fela. However, the low number of tools is not an uncommon feature at MSA sites, but similar proportions were found at the previously mentioned MSA sites in Botswana and Limpopo Province in South Africa (see Chapter 2). The 80 identified tools at the Botlhano Fela site were categorised as points, scrapers, denticulates, backed artefacts, various types of borers, knives, miscellaneous retouched pieces and hammer/grinding stones. Table 6 illustrates the various categories of tools according to raw material types. A notable feature of the tool assemblage is that only a few lithic tools (n=4) were made from quartz, despite the large quantities of the raw material being recovered at the Botlhano Fela site. The vast majority of tools were made from cryptocrystalline raw materials and finely-grained quartzite. In addition to raw material types, variables likely to provide information about the manufacture process of the tools were recorded. These variables are the maximum length and width of artefact, the amount of outer weathered surface, the butt-shape and - type, the retouch-position and - type, the angle and curvature of removals on the lithic artefact.

Tools																						
Tool type/ Raw material	Undisturbed units										Disturbed units										Operation 2	
	*Po.	Sc.	De.	MRP	G./H.	K.	B.	Ba.	Total	%	Po.	Sc.	De.	MRP	G./H.	K.	B.	Ba.	Total	%	Total	%
Quartz	1	1	1	0	0	0	0	0	3	5%	0	1	0	0	0	0	0	0	1	6%	4	5%
Quartzite	4	3	2	3	2	3	1	0	18	29%	3	1	0	0	1	0	0	0	5	29%	23	29%
Agate	2	5	7	6	0	1	1	0	22	35%	2	0	3	1	0	0	0	0	6	35%	28	35%
Jasper	1	0	1	1	0	0	2	0	5	8%	0	1	2	0	0	0	0	0	3	18%	8	10%
Chalcedony	2	0	0	0	0	0	0	1	3	5%	0	0	0	0	0	0	0	0	0	0%	3	4%
Degraded	7	1	1	0	0	0	0	1	10	16%	1	1	0	0	0	0	0	0	2	12%	12	15%
Other/ Undetermined	0	1	0	0	0	1	0	0	2	3%	0	0	0	0	0	0	0	0	0	0%	2	3%
Total	17	11	12	10	2	5	4	2	63	100%	6	4	5	1	1	0	0	0	17	100%	80	100%
%	27%	17%	19%	16%	3%	8%	6%	3%	100%	-	35%	24%	29%	6%	6%	0%	0%	0%	100%	-	100%	-

Table 6: Overview of the lithic tool assemblage (n=80) according to undisturbed and disturbed units from the MSA levels of Operation 2, Botlhano Fela. *Po.=Point, Sc.=Scraper, De.=Denticulate, MRP=Miscellaneous Retouched Piece, G./H.=Grinding-/Hammer stone, Kn.= Knife, B.=Borer, Ba.=Backed artefact (Table: Myrer 2010)

Points

Various points or point fragments are the main tool type in this assemblage, and are found in both the undisturbed and disturbed units at the Botlhano Fela site (table 6). These lithic artefacts were classified as points because of their pointed shape, and various types of points were also recognised.

Firstly, five unifacially retouched points were recovered in the deepest levels, i.e. levels 21 - 24, of the MSA deposit at Botlhano Fela (figure 10:c-e). Retouched points are a diagnostic MSA artefact, corresponding to similar points found at #Gi (Brooks et al. 1980; Kuman 1989), Rhino Cave (Robbins et al. 2000b:20), White Paintings Shelter (Murphy 1999:159; Robbins et al. 2000a:1105), Cave of Hearths (Sinclair & McNabb 2005:184) and Kudu Koppie (Kuman et al. 2005b:27). The majority of the retouched points from the above sites were made on finely-grained raw materials, such as chalcedony, jasper or silcrete. Similarly, the small sample of retouched points from Botlhano Fela indicate the use of finely-grained raw materials for the production of this tool type. Four of the retouched Botlhano Fela points were made of cryptocrystalline materials, i.e. chalcedony, jasper and agate. The fifth point was made of a finely-grained quartz (10:d), which also was utilised for retouched points at Rhino Cave (Robbins et al. 1996:32). Furthermore, the striking position for the unifacially retouched points at Botlhano Fela was recorded. This feature was only visible on two of the unifacially retouched points, as the remaining points were heavily fragmented (figure 10:d,e). The angle of detachment on the two points was determined to be corner-struck similar to the Rhino Cave and #Gi points. This particular attribute is, as previously mentioned, argued to be a characteristic of the discoidal technique (Chazan 1997:729; Kuman 1989:259).

Eighteen *Levallois* points were recognised in the Botlhano Fela MSA deposit, and are commonly characterised by one or more triangular dorsal scar (figure 10:a,b). This artefact is also considered to be diagnostic of the MSA period, and are comparable to artefacts found at for example the White Paintings Shelter (Murphy 1999:215), Cave of Hearths (Sinclair & McNabb 2005:184) and Kudu Koppie (Kuman et al. 2005b:27). The *Levallois* points in the Botlhano Fela assemblage were mainly made in quartzite, while a few are also in agate (table 6). A large quantity of points were also found to be in a fully degraded material and heavily fragmented, as demonstrated by artefact BF3605 (figure 10:b). The few intact specimens exhibit a large bulb of percussion (figure 10:a - drawing). This feature indicates the use of a direct percussion hard hammer method for detachment, and is one criterion for determining the use of the *Levallois* technique (Chazan 1997:724).

Scrapers

Fifteen scrapers were identified in the Botlhano Fela lithic assemblage (figure 10:f-i). They were generally found in a fragmented state, and only two specimens were complete. Given the heavy fragmentation, it was problematical to identify any patterns in shape or form of the various scrapers. The specimens were found in all varieties of raw material, but most commonly in cryptocrystalline materials. Additionally, nearly half of the scrapers were made on flakes with remnants of outer

weathered surface of the cobble. The scrapers commonly have one retouched edge, and the type of retouch is normal to fine with a curvature ranging from convex to convex-linear. The maximum dimension of the scrapers in the assemblage were measured to about 3 - 4 cm. However, one scraper, found in level 21 of the undisturbed deposit, was measured to be 12 cm in length (figure 10:h). The large scraper was classified as a side- and end-scraper on account of left dorsal and proximal retouch. Scrapers are a common artefact-type for several periods, however, the various sizes can give an indication to the period. Scrapers from MSA tend to be medium-sized, which eventually develops into a microlithic size in the LSA and is followed by large scrapers in the IA (Walker 1998:74-75; Robbins et al. 2000a:1098). The large scraper is, therefore, argued to be associated with a more recent period than the MSA.

Denticulates

Denticulates make up a significant amount (n=17) of the total tool assemblage. Although, scrapers are not diagnostic artefacts, it is a common tool type at several MSA sites (Brooks et al. 1980; Kuman 1989; Murphy 1999; Robbins et al. 2000a). All denticulates in the Botlhano Fela assemblage were found to be heavily fragmented (figure 11:a,b). Most denticulates were made on the cryptocrystalline raw materials agate and jasper. They were mainly retouched to a semi-abrupt angle, and have a rectilinear to concave-linear curvature.

Miscellaneous retouched pieces

Miscellaneous retouched pieces (MRP) is a term employed for artefacts that show sustained retouch, but cannot readily be accommodated within any formal tool class. Ten heavily fragmented lithic artefacts were categorised as MRP in the Botlhano Fela MSA assemblage. These specimens were made from the finely-grained raw materials: agate, quartzite and jasper.

Grinding- and/or hammer stones

A total of five stones with signs of smoothing or pecking were found in the lithic assemblage from the MSA levels of Botlhano Fela. The artefacts were all made of finely-grained red quartzite. Four specimens were possibly lower grinding stones, but were found in a heavily fragmented state (figure 11:c). The fifth stone is a complete oval-shaped cobble which would fit in the palm of a hand (figure 11:d). It has dents and larger battering marks on both opposite edges and one smoothed surface, possibly resulting from the combination of use as a hammer- and grindstone. This artefact, found in Level 23 of the undisturbed deposit, could have been used to burnish ceramics on account

of the highly smoothed surface. These artefact types are commonly affiliated with IA contexts in Botswana (Denbow 1981; Denbow et al. 2008; Murphy et al. 1994).

Knives

Knives are blades with retouch along either one or two straight edges, and are commonly associated with the LSA period (Murphy 1999:142). Four fragmented knives were identified in the Botlhano Fela assemblage, and the artefacts were found ranging from level 15 to 23 in the undisturbed deposit (figure 11:e,f). The knives were made from finely-grained raw materials.

Borers

Borers have a pointed distal end with one or more edges having a normal to denticulate retouch (figure 11:g,h). This tool type has not been recognised from MSA contexts (Murphy 1999:87). In total, four different borers, made from finely grained materials, were identified in the Botlhano Fela MSA deposit. The artefacts were found ranging from level 11 to level 21 in the undisturbed units.

Backed artefacts

The backed artefact type of segments are made from a flake or part of a micro-blade. Two microlithic segments were found in level 9 and level 13 of the undisturbed deposits at Botlhano Fela (figure 11:i,j). These segments are diagnostic of the LSA, and closely resembles artefacts found in the LSA levels of White Paintings Shelter (Murphy 1999; Robbins et al. 2000a), #Gi (Brooks et al. 1980; Brooks & Yellen 1977; Kuman 1989), the Thamaga I site (Robbins 1986, 1984a) and Toteng (Robbins 1984b). Both of the Botlhano Fela specimens are made from chalcedony. However, the chalcedony of the two segments are of divergent appearance due to thermal alteration and degradation. Despite this difference, the segments are interpreted to originate from the same chalcedony cobble through minimum analytical nodule analysis, which will be elaborated in the following section.

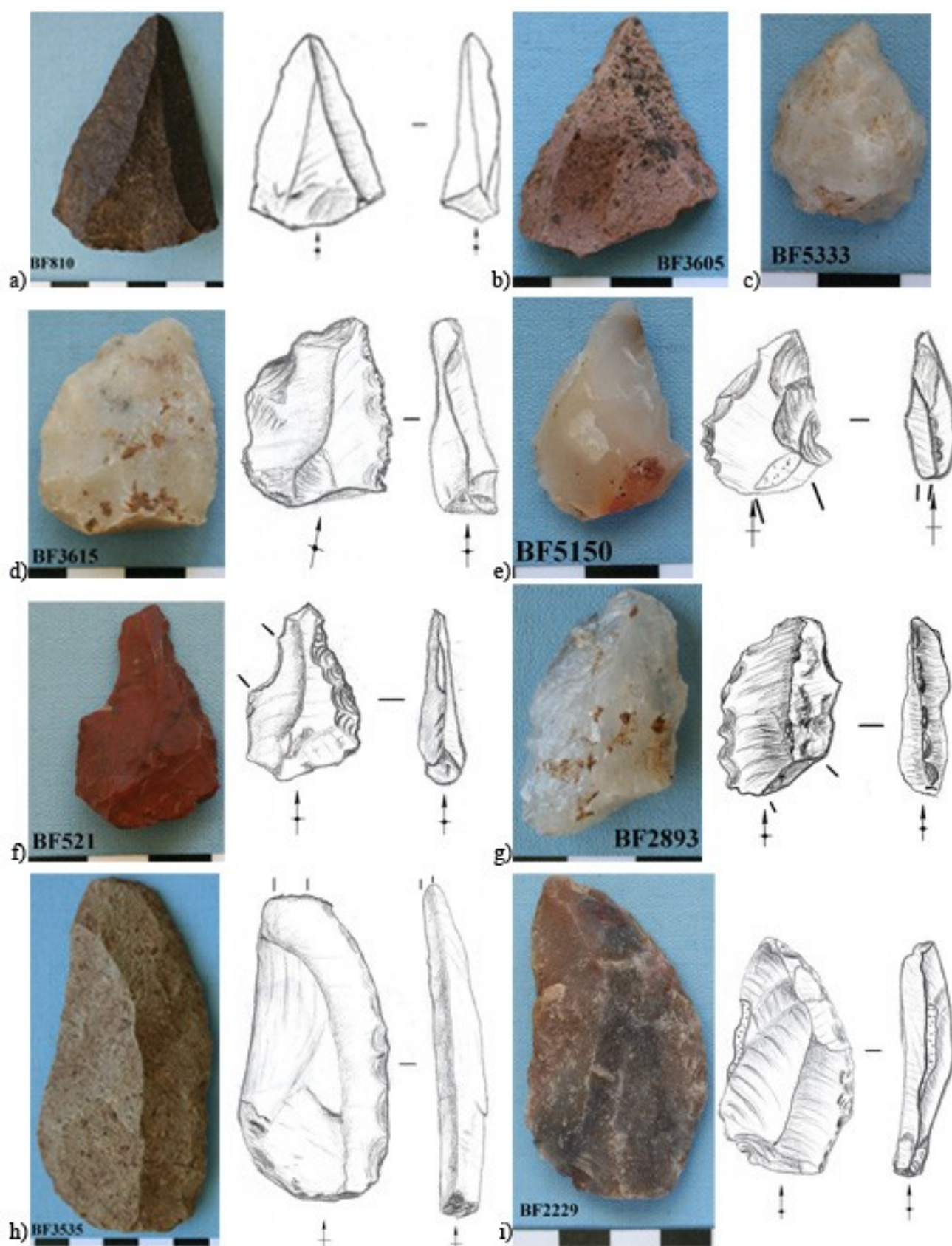


Figure 10: Tools from the MSA levels of Operation 2, Botlhano Fela: Levallois points: a) quartzite, b) fully degraded material – *drawing n/a*, Unifacial points: c) quartz, d) chalcedony, e) chalcedony – *drawing n/a*, Scrapers: f) jasper, g) quartz, h) fully degraded material, i) quartzite (Photo and drawings: Myrer 2008)

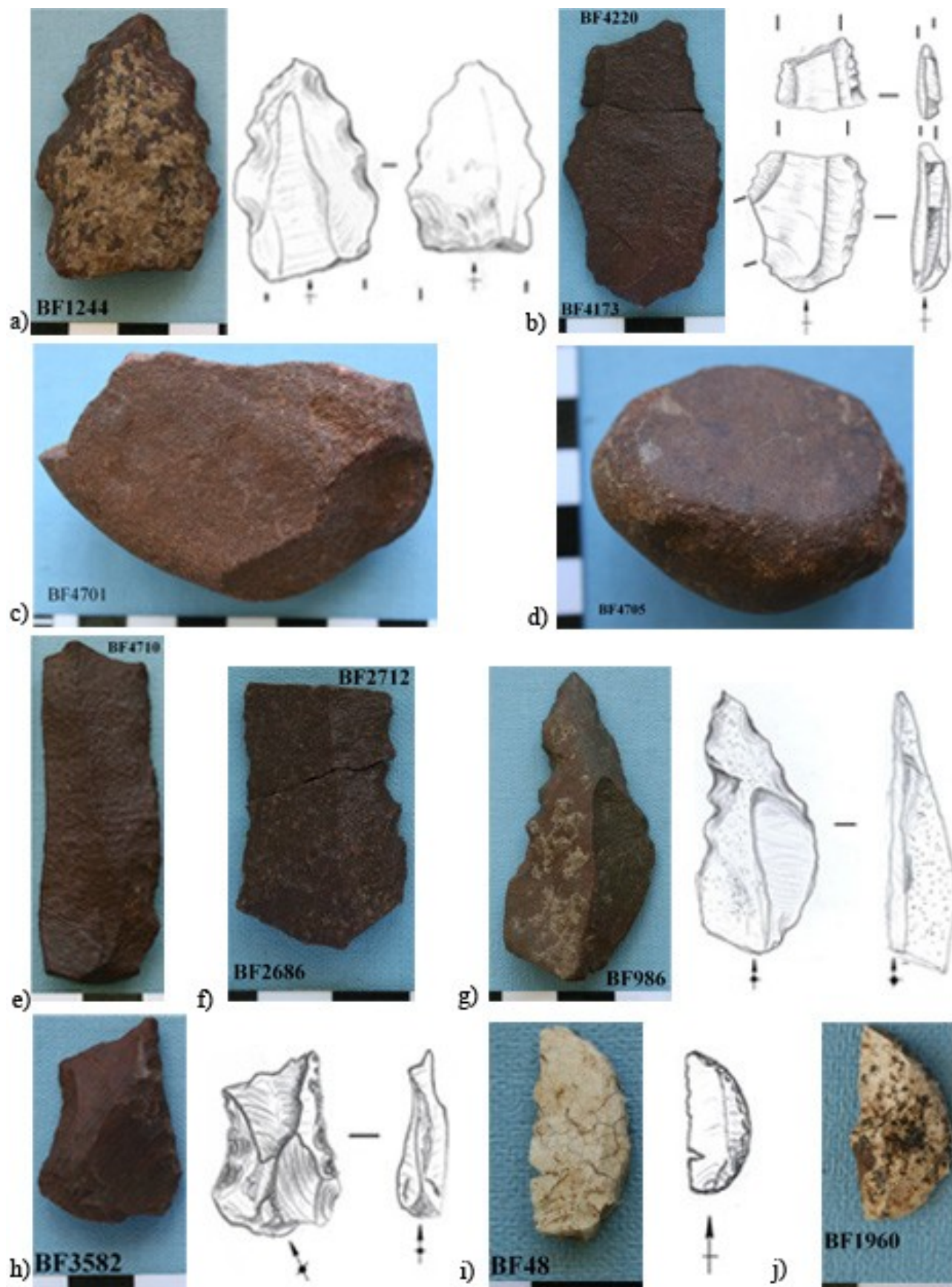


Figure 11: Tools from the MSA levels of Operation 2, Botlhano Fela: Denticulate: a) agate (note: dorsal surface of artefact is covered with cemented deposit), b) quartzite (refitted), Grinding stone: c) quartzite – *drawing n/a*, Grinding-/hammer stone: d) quartzite - *drawing n/a*, Knives: e) quartzite - *drawing n/a*, f) quartzite (refitted) - *drawing n/a*, Borer: g) quartzite h) banded jasper (“ironstone”), Microlithic segment: i) burnt chalcedony, j) partly degraded chalcedony - *drawing n/a* (Photos and drawings: Myrer 2008)

6.3 Minimum analytical nodules and refitted lithics

As described in the first part of this chapter, a wide range of raw materials were identified from the MSA levels of Botlhano Fela. A limited quantity of these raw materials were further sorted into minimum analytical nodules. See Chapter 5 for a definition of minimum analytical nodule analysis. The following pages will present a selection of minimum analytical nodules, and the specific variables that were considered for associating lithic material to a particular nodule. The association of material in minimum analytical nodules will be supported by the systematic refitting of lithic artefacts within the nodules. Not all of the established minimum analytical nodules could be verified by the presence of refitted material (see Appendix IV). However, the absence of refits does not suggest that these nodules are invalid, but the association of the material is less certain. Furthermore, the results of the minimum analytical nodule analysis and refits provide information about the vertical and horizontal movement of artefacts, as well as technological features and manufacture stages in the assemblage.

6.3.1 Minimum analytical nodules

Easily distinguishable raw materials were subdivided into minimum analytical nodules mainly based on characteristics such as colour, distinctive patterns, inclusions and outer surface. Thirteen minimum analytical nodule groups were established from the Botlhano Fela lithic assemblage, and named in alphabetical order from nodules “Group A” to “Group M”. The thirteen minimum analytical nodules have been identified as four quartzite nodules, three agate nodules, three jasper/agate nodules (i.e. the raw material is heterogeneous in composition), one jasper nodule, one chalcedony nodule, as well as one metamorphic rock nodule. The thirteen groups account for a total of 180 pieces, which is about 3% of the entire lithic assemblage from the MSA levels at the Botlhano Fela site. An overview and description of all the various minimum analytical nodules can be found in Appendix IV.

As previously mentioned, the assumption behind a minimum analytical nodule analysis is that the grouped material derives from the same nodule on the basis of several shared features. This is exemplified by the distinct orange-brown agate with dark inclusions from nodule “Group J” (figure 12). In addition, all flakes from this agate nodule group with a visible proximal end have a small bulb of percussion. This indicates the use of the same technique (i.e. soft hammer) for detaching the flakes, and constitutes an additional argument for the material as deriving from the same nodule.



Figure 12: Sample of débitage from minimum analytical nodule "Group J" from the MSA levels of Operation 2, Botlhano Fela (Photo: Myrer 2008)



Figure 13: Sample of débitage from minimum analytical nodule "Group I" from the MSA levels of Operation 2, Botlhano Fela (Photo: Myrer 2008)

The sample of material shown in figure 13, illustrates another example of an easily distinguishable minimum analytical nodule, i.e. “Group I”. The material within this agate/jasper conglomerate nodule share features such as a dark red colour with white patches, and several of the specimens also have an orange-brown outer weathered surface. Moreover, a refit of two artefacts from this nodule was found, which further support a classification of the material to “Group I”(see 6.3.2 Refitted lithics).

However, visible characteristics within the same cobble could alter due to degradation, thermal alteration, gradations within the material, and staining, which complicates the sorting and determination of minimum analytical nodules.

The chalcedony nodule “Group A” incorporates lithics subjected to degradation and thermal alteration, as exemplified by the two earlier described microlithic segments (figure 11:i-j). Figure 14 further demonstrate the varied appearances of the material grouped within this minimum analytical nodule. The chalcedony pieces (2) in the middle of the figure show a combination of features from the fully degraded, opaque pieces (1) at the top of the figure and the translucent pieces (3) at the bottom of the figure. Additionally, all of the

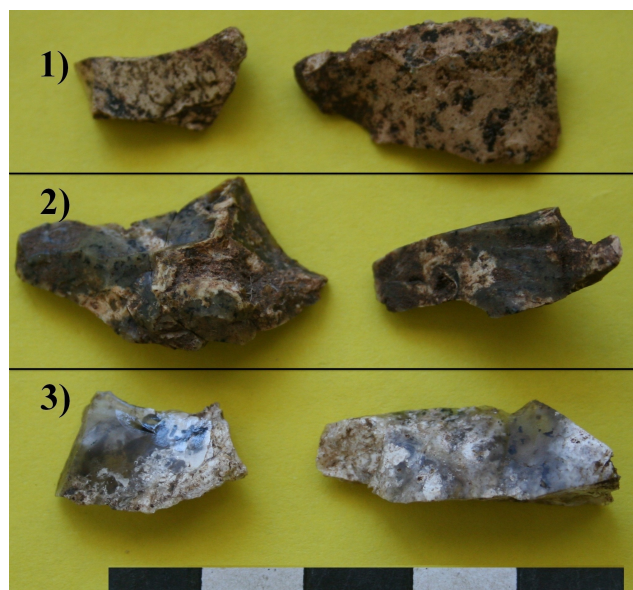


Figure 14: Sample of débitage from minimum analytical nodule "Group A" from the MSA levels of Operation 2, Botlhano Fela. The condition of the material ranges from 1) fully degraded, 2) partly degraded to 3) translucent chalcedony. Note the dark inclusions (Photo: Myrer 2008)

chalcedony pieces have small inclusions of black material. On account of the transitional pieces (2), as well as the inclusions recognised in all of the grouped material, the material sorted to minimum analytical nodule “Group A” is argued to have been detached with great certainty from the same cobble of material.

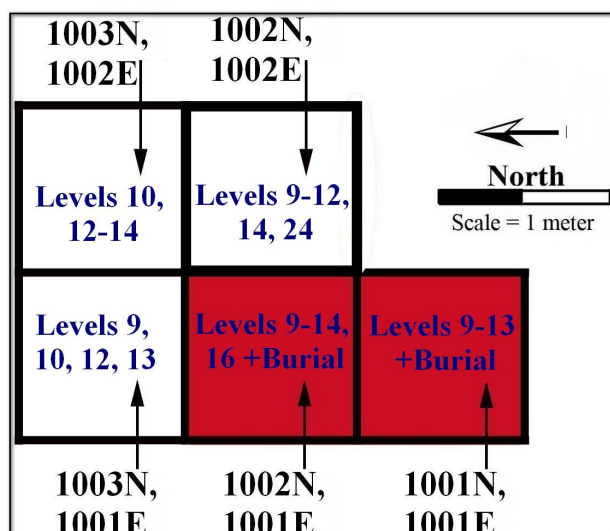


Figure 15: Vertical and horizontal distribution of minimum analytical chalcedony nodule "Group A" in Operation 2, Botlhano Fela (Figure: Myrer 2010)

found in the upper levels of the MSA deposit, but specimens were also recovered at the lowest levels in all units and in both the undisturbed and disturbed deposit. A broad distribution of lithic material within other minimum analytical nodules were also demonstrated by the agate nodule “Group J” and agate/nodule “Group I” (figure 16 and 17). The material from the two nodules were found at several levels of both the undisturbed and disturbed deposit.

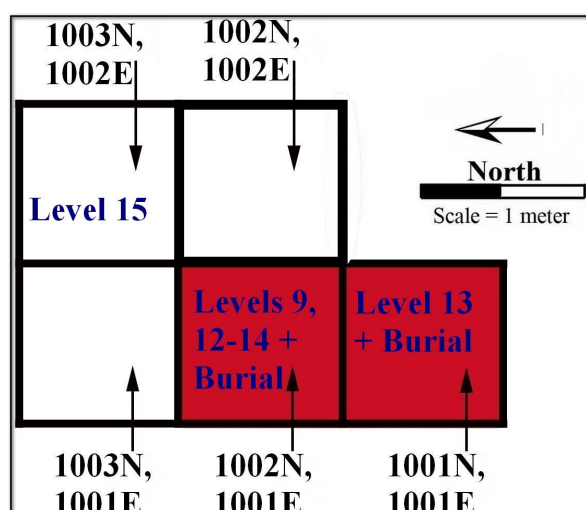


Figure 16: Vertical and horizontal distribution of minimum analytical agate/jasper nodule "Group I" in Operation 2, Botlhano Fela (Figure: Myrer 2010)

The vertical and horizontal distribution of the minimum analytical nodules from the MSA levels at Botlhano Fela demonstrate that material from the majority of nodules were found ranging across a significant distance in both undisturbed and disturbed units (see Appendix IV for an overview of the horizontal and vertical distribution of all minimum analytical nodules). This is particularly evident by material in the minimum analytical chalcedony nodule “Group A” (figure 15). The bulk of materials associated to this nodule were

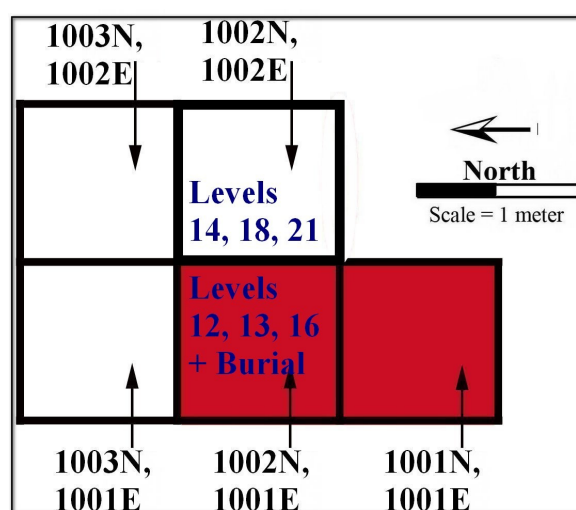


Figure 17: Vertical and horizontal distribution of minimum analytical agate nodule "Group J" in Operation 2, Botlhano Fela (Figure: Myrer 2010)

6.3.2 Refitted lithics

Of 6180 lithic artefacts found in the MSA levels of Botlhano Fela, a total of 74 lithics (about 1%) proved to refit. Two types of refits were recorded (Table V and VI in Appendix VI):

1. mending of fractured lithics (n=55), and
2. conjoining of knapped lithics (n=19) in a reduction sequence.

Mended lithic artefacts make up the majority of refits found in the Botlhano Fela assemblage. A technological classification of the mended artefacts show that the specimens mainly comprise of broken flakes and debris, followed by broken tools and cores. The significant amount of refitted fractured artefacts corresponds to the large proportion of fractured artefacts in the total lithic assemblage at the MSA levels of Botlhano Fela (Table II in Appendix VI).

The distribution of refitted artefacts show that a total of 39 mended refits and 11 conjoined refits were found in the undisturbed units, whereas 16 mended refits and 8 conjoined refits occurred in the disturbed units. Of the mended refits, only one artefact was recovered at separate levels (indicated pink in figure 18). The medial section of the denticulate tool was recovered in Level 9 and the

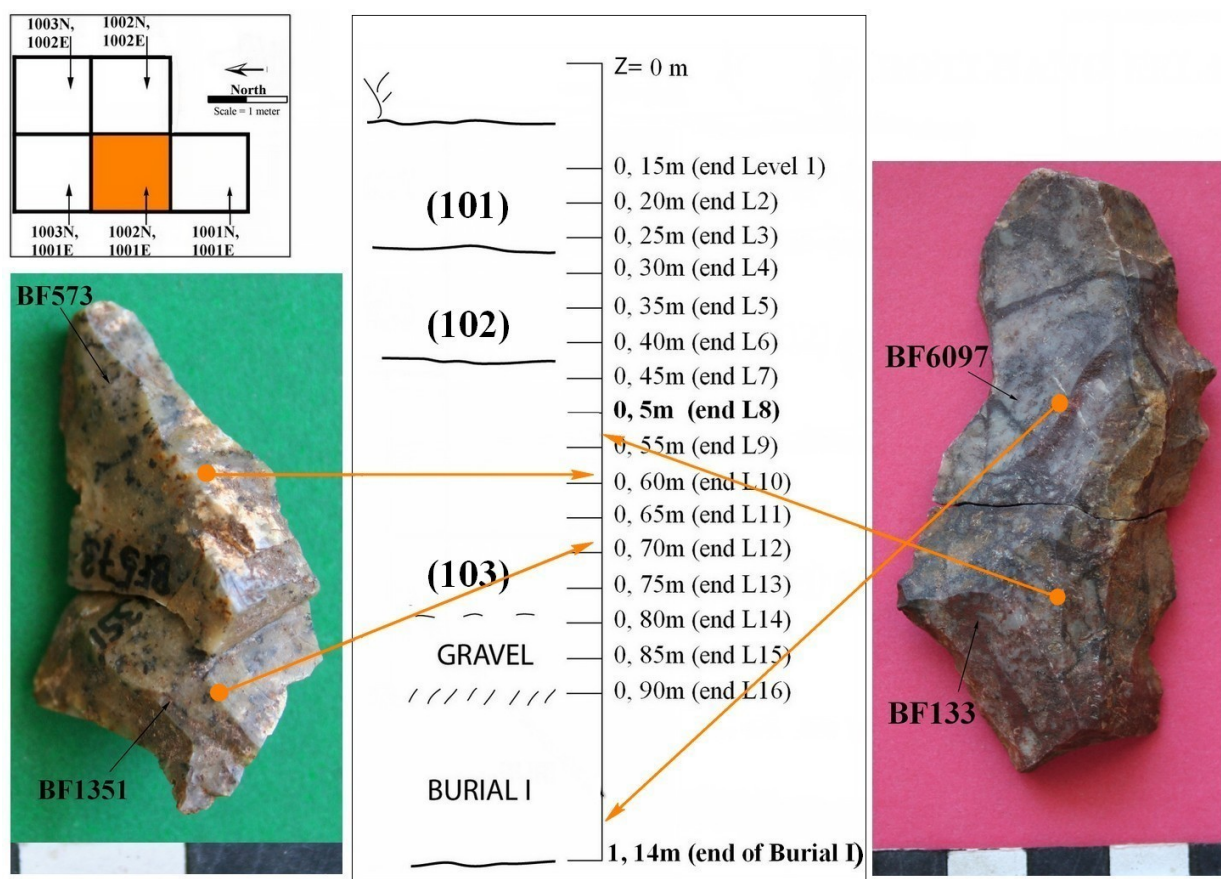


Figure 18: Distribution of refitted lithic artefacts found in unit 1002N 1001E at Botlhano Fela. *Green:* Refitted débitage of minimum analytical nodule “Group A” found in Level 10 and Level 12. *Pink:* Broken denticulate tool within minimum analytical nodule “Group I” recovered separately in Level 9 and in burial (Wall drawing: Cohen 2007; Photos: Myrer 2008)

proximal section in the burial, proposing a maximum movement of 63 cm between the two pieces. The distribution of this refitted artefact suggests to a significant movement of the deposit. However, the mended denticulate tool was recovered in a unit above the LSA burial where disturbed deposit was to be expected. This is further demonstrated by a conjoined refit of two flakes found at two separate levels in the same unit (indicated green in figure 18). The above refitted artefacts also support the proposed association of material within the two minimum analytical nodules “Group I” and “Group A”. As demonstrated earlier, the material in these nodules were found to be significantly dispersed throughout the undisturbed and disturbed units (figure 15 and 16).

The vertical distribution of material in the undisturbed deposit is also suggested by the conjoined refits of six lithic artefacts (indicated pink in figure 19). The refitted fragments within the minimum analytical nodule “Group H” were recovered ranging from level 21 to 24, and indicates a displacement of up to 20 cm between the members. Furthermore, horizontal and vertical movement

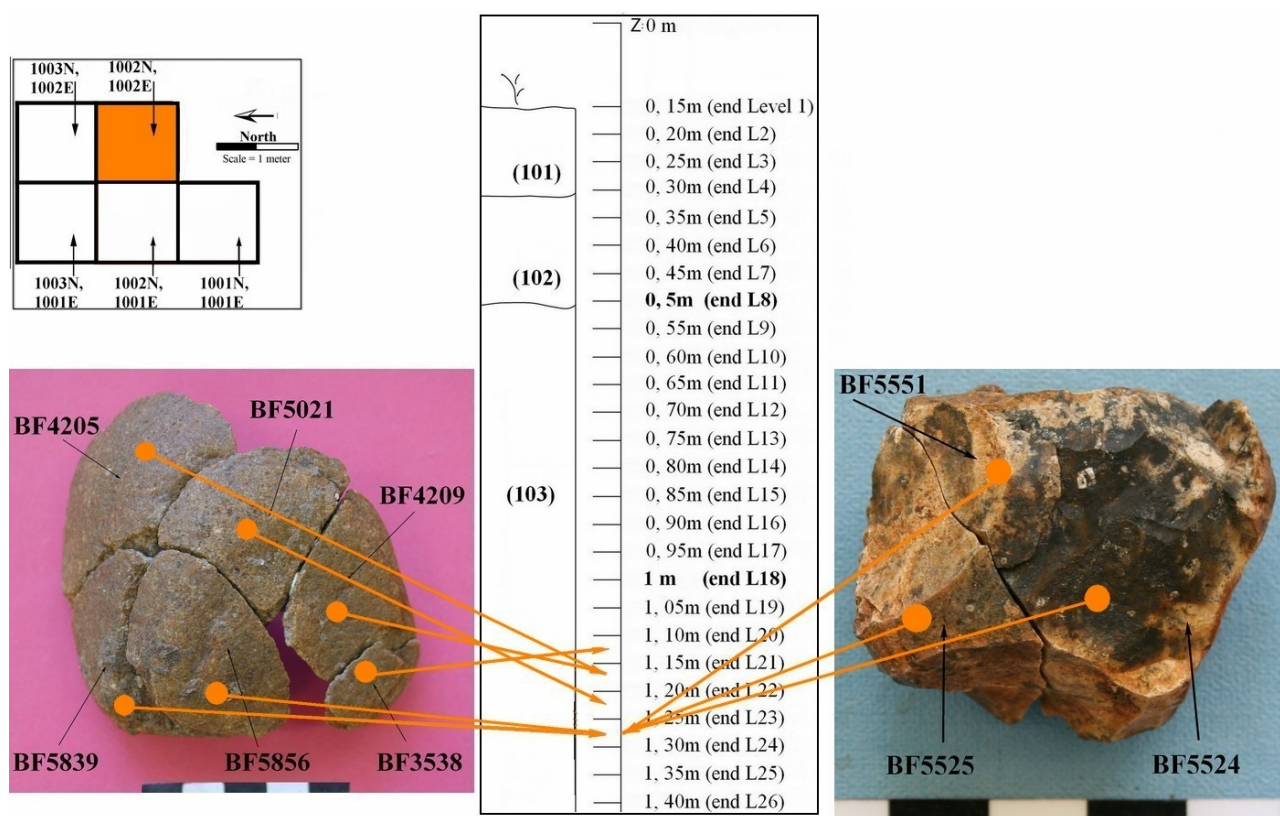


Figure 19: Distribution of refitted lithic artefacts found in unit 1002N 1002E at Botlhano Fela. *Pink:* Six fragmented pieces were found at a distance from Level 21 to Level 24. *Blue:* Amorphous core refitted to flakes within agate nodule "Group M" recovered at Level 24 (Wall drawing: Cohen 2007; Photos: Myrer 2008)

of material is proposed by the conjoined refit of a flake to a preform of a possible unifacial (figure 20). The conjoined artefacts, determined to the minimum analytical quartzite nodule “Group F”, were recovered up to 15 cm apart in level 10 and level 12, as well as in two separate units. The deposit of the two units is considered to be undisturbed. Additionally, the remaining material within

this quartzite nodule was found to be distributed at an even greater distance ranging from 0, 6 meters up to 1, 2 meters into the MSA deposit (Appendix IV).

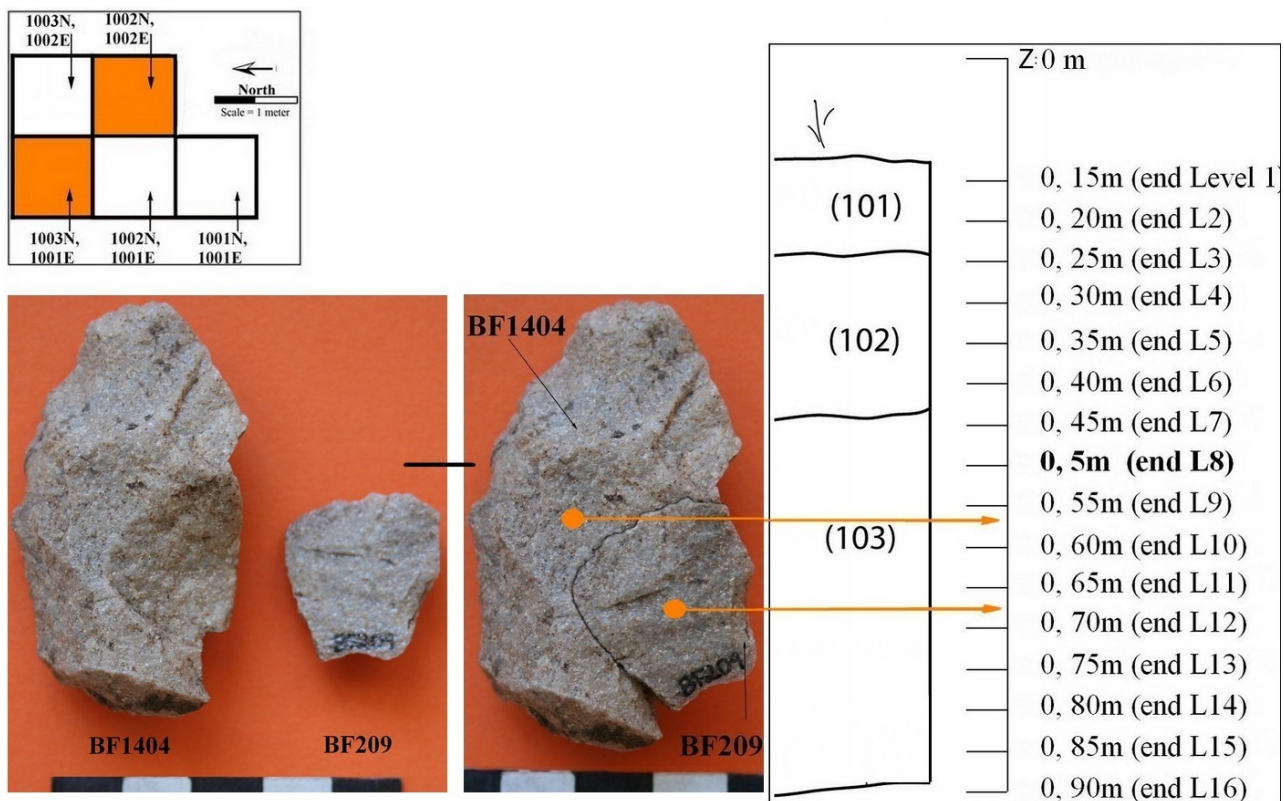


Figure 20: Distribution of refitted lithic artefacts from minimum analytical nodule “Group F”. The preform (BF1404) was found in Level 10 - unit 1002N 1002E and the related flake (BF209) in Level 12 - unit 1003N 1001E at Botlthano Fela (Wall drawing: Cohen 2007; Photos: Myrer 2008)

The refitted material from the MSA levels of Botlthano Fela also suggests to various stages of an operational sequence of knapping events occurring at the site. These are represented by the above conjoined preform and flake, a few conjoined flakes, as well as refitted cores (Table VI in Appendix VI). An amorphous core was refitted to two flakes within agate nodule “Group M”, and all material was recovered at same level and unit (indicated blue in figure 19). This core and the related débitage have no remaining outer weathered surface, whereas the two refitted *Levallois* cores and related débitage exhibit significant amounts of a rounded outer weathered surface (figure 20). The conjoined refitted sets will be interpreted further in the following Chapter 7.3 – Reconstruction of the *chaîne opératoires* of Botlthano Fela

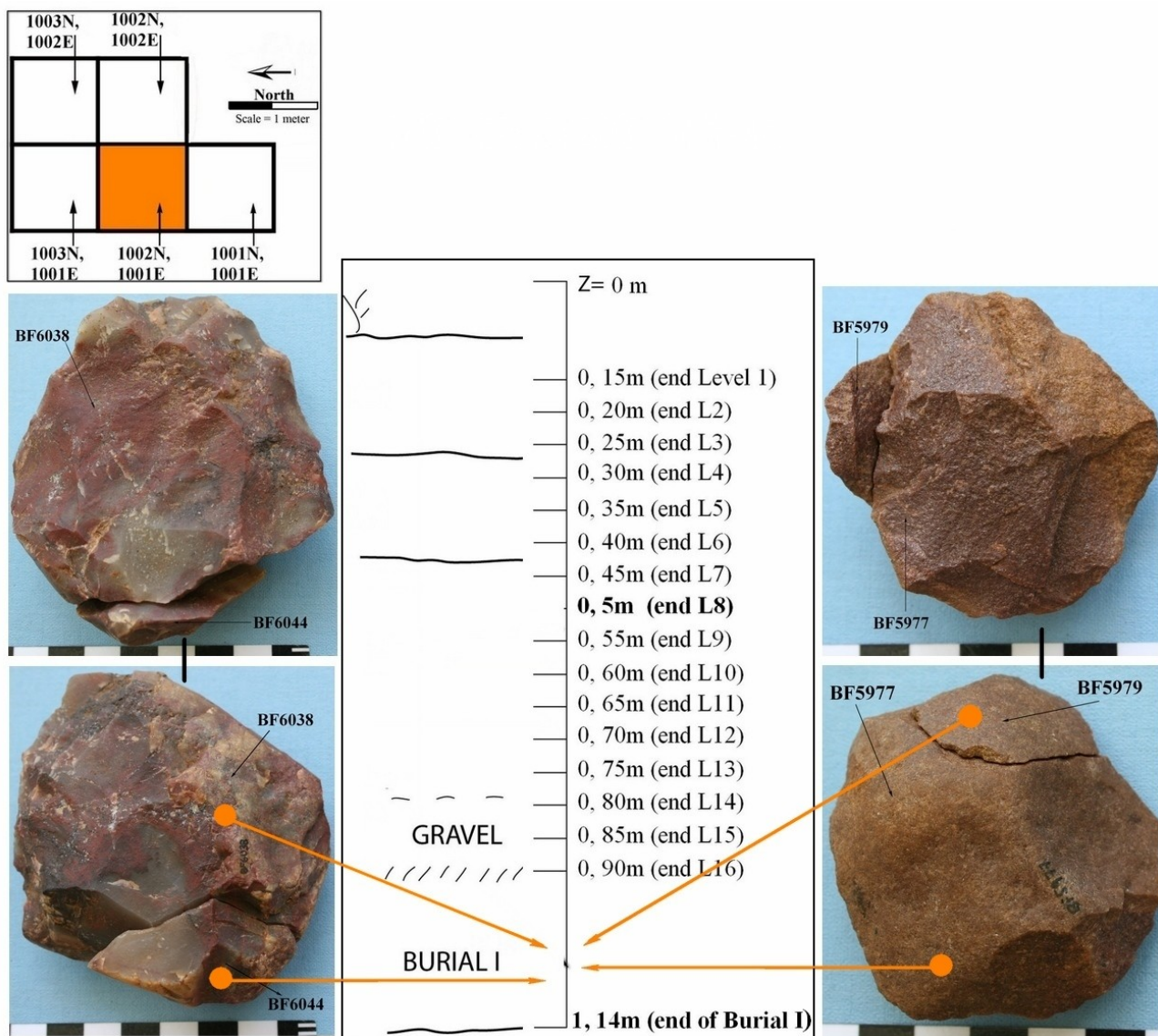


Figure 21: Levallois cores with refitted flakes found at equal level and unit at Botlhano Fela. *Left:* Core (BF6038) and flake (BF6044) within agate/jasper nodule "Group K". *Right:* Core (BF5977) and flake (BF5979) within quartzite nodule "Group L" (Wall drawing: Cohen 2007; Photos : Myrer 2008)

Summary;

The MSA levels of Operation 2 at Botlhano Fela yielded a substantial number of lithic material. The concentration of lithic material was particularly high towards the lowest levels of the deepest excavated unit of the site.

The Botlhano Fela assemblage were identified to consist of a wide range of raw material types in a large variety of colours and qualities. Quartz constitutes the majority of material, followed by the sum of the cryptocrystalline materials: agate, jasper and chalcedony, and quartzite material. A

significant amount of the assemblage had also been fully degraded, and could not be identified to the initial raw material type. Stained and thermally altered material were also commonly observed.

The predominant lithic category is débitage material, while cores and tools account for a modest amount of the entire lithic assemblage. The identified core types are amorphous, single platform, *Levallois* and discoidal cores, which represents different technological approaches for detachment of lithic materials. In general, the cores have a fairly high number of scar removals and little or no outer weathered surface, which indicate to the intensity of core reduction. Tools were commonly made of cryptocrystalline raw materials, and remarkably only a few lithic tools were made from quartz. The frequent tool types in the assemblage were various points and scrapers, followed by denticulates, miscellaneous retouched pieces, grinding-/ hammerstones, borers and microlithic backed artefacts. Several diagnostic artefact types were recognised in the assemblage, whereas the *Levallois* points and cores, unifacial points and discoidal cores are particularly defining for the MSA period. Other artefact types associated with more recent periods, such as the microlithic segments, the large scraper, knives and the grinding-/hammerstone, were also recognised in the MSA deposit of Botlhano Fela.

A limited amount of easily distinguishable raw materials were grouped to thirteen minimum analytical nodules: “Group A” to “Group M”. The material within a minimum analytical nodule share common features, such as colour, inclusions, and shape. The association of material within several nodules were supported by refits. The distribution of the minimum analytical nodule and refits suggests a significant movement of material in both the undisturbed and disturbed deposit. The result of minimum analytical nodule analysis and the refitting examination also provide information on various manufacture stages occurring at the Botlhano Fela site.

7: Results and interpretations

The lithic analysis comprised of an identification of the raw materials, and a classification of lithic artefacts with emphasis on diagnostic features. Subsequently, this was supplemented by a minimum analytical nodule analysis and refitting examination. These analyses provide a basis for interpreting the MSA levels of Operation 2 at the Botlhano Fela site, which will be seen in relation with the results of David Cohen's examination of the lithic assemblage from the upper IA and LSA levels.

The first section of this chapter will give a brief presentation of Cohen's lithic analysis. As previously mentioned, the deposits from the IA/LSA levels and the MSA levels were treated as separate entities for analysis. The separation of the Botlhano Fela lithic assemblage was based on Cohen's assumption of very little, if any, intermixing of the stratigraphic layers. The only exception to this would be in the units affected by the burial (pers. comm. Cohen 2008). Therefore, the following chapter will begin with an evaluation of the stratigraphical integrity of the site – both the disturbed units and the assumed undisturbed units, as this is a prerequisite for valid archaeological interpretations. On the basis of these results, a reconstruction of the *chaîne opératoires* evident in the lithic assemblage at the Botlhano Fela site can be proposed.

7.1 The lithic assemblage of the IA and LSA levels at Botlhano Fela

The examination of the Botlhano Fela site was, as presented in the introduction, initially conducted to address questions related to group interaction between the hunter-gatherers and farmers inhabiting the Metsemotlhaba River valley. The Botlhano Fela site was interpreted by the excavator to be associated with farmers, and would, therefore, complement the examination of the hunter-gatherer sites in the vicinity. Cohen conducted an in-depth analysis on a variety of materials mainly from the upper zones 101 and 102 in all four excavated areas at the site: Operation 1 - 4 (figure 5). In addition, the materials from the lower Zone 103 in Operation 1 and the upper levels (i.e. 6 - 8) of Zone 103 in Operation 2 were included, as the deposit contained pottery and lithics which appeared diagnostic of the LSA. Accordingly, the first three levels of Zone 103 in Operation 2 is argued to produce evidence of the presence of lithic tool-using hunter-gatherers living on the hilltop, before its occupation of farmers (Cohen 2009:3).

In the following pages, Cohen's examination of the lithic assemblage from the IA/LSA levels of the Botlhano Fela site is presented. The lithic artefacts found in the IA and LSA levels of Operation 2 is particularly emphasised, as this excavated area is in focus for the current thesis (figure 7). In all, the lithic material from the upper zones, including the small portion from the upper levels of Zone 103, accounts for almost 19 000 pieces and weighs about 85 kilograms. The total amount of lithics yielded from the Operation 1- 4, i.e. 13 square meters, testifies to the immense volume of cultural deposit over a large area on the Botlhano Fela hilltop (figure 5). Cohen's interpretations of this assemblage are presented according to the identified categories of lithic artefacts, and procurement and type of raw materials. The results and interpretations of his analysis of the assumed IA and LSA levels will, subsequently, be seen in relation with the lithic analysis of the assemblage from the MSA levels of Operation 2 at Botlhano Fela.

7.1.1 Procurement and type of raw materials

Cohen's results demonstrated that quartz and cryptocrystalline raw materials constitute most of the assemblage in the IA and LSA levels at Botlhano Fela, and a relatively modest amount is quartzite rocks. The majority of identified tools were made of chalcedony or other types of cryptocrystalline raw materials (Cohen 2009:17). The frequency of the various raw material types does not vary much throughout the stratigraphical zones. This is argued to indicate that the raw materials were used as they were encountered in the landscape, and not acquired from for example quarries (Cohen 2009:17). Most of the raw materials likely to have been used during the occupations of Botlhano Fela, were interpreted to have been procured from the immediate area, on the hilltop, in erosion gulleys and in the sandy riverbanks of the Metsemotlhaba River (Cohen 2009:17).

7.1.2 Categories of the lithic assemblage

The majority of lithic artefacts at the IA and LSA levels of Botlhano Fela has been identified to be débitage. To obtain information from this lithic category, Cohen conducted a mass débitage analysis (Andrefsky 2007:131 - 141; Odell 2003:130 - 132). By the application of this approach, information on the amount of outer weathered surface on each lithic artefact was recorded. In Operation 2, the majority of the lithic material were found to have partial or no outer weathered surface. This feature is interpreted by the excavator to be the products of middle or later stages of reduction. Only a small percentage of the débitage is interpreted to be the results of the initial stages of reduction (Cohen 2009:16).

In Operation 2, a total of 21 lithic artefacts were identified by Cohen (2009:9) as “stone-tool types (...)” (figure 22). However, it is not clear from figure 22 to what Cohen defines as “stone-tools” as this category also seem to include cores, core-fragments and unretouched flakes. Most of the lithic artefacts defined as “stone-tools” were recovered in the upper part of the MSA levels (i.e. levels 6 - 8), which is in sharp contrast to the great variety of lithic tools and cores in the lower deposit. Cohen (2009:10) interprets the low amount and little variety of lithic tools in the uppermost zones to indicate that the hilltop inhabitants mainly relied on expediently made flakes, but notes that the argument is not very solid due to the small sample size.

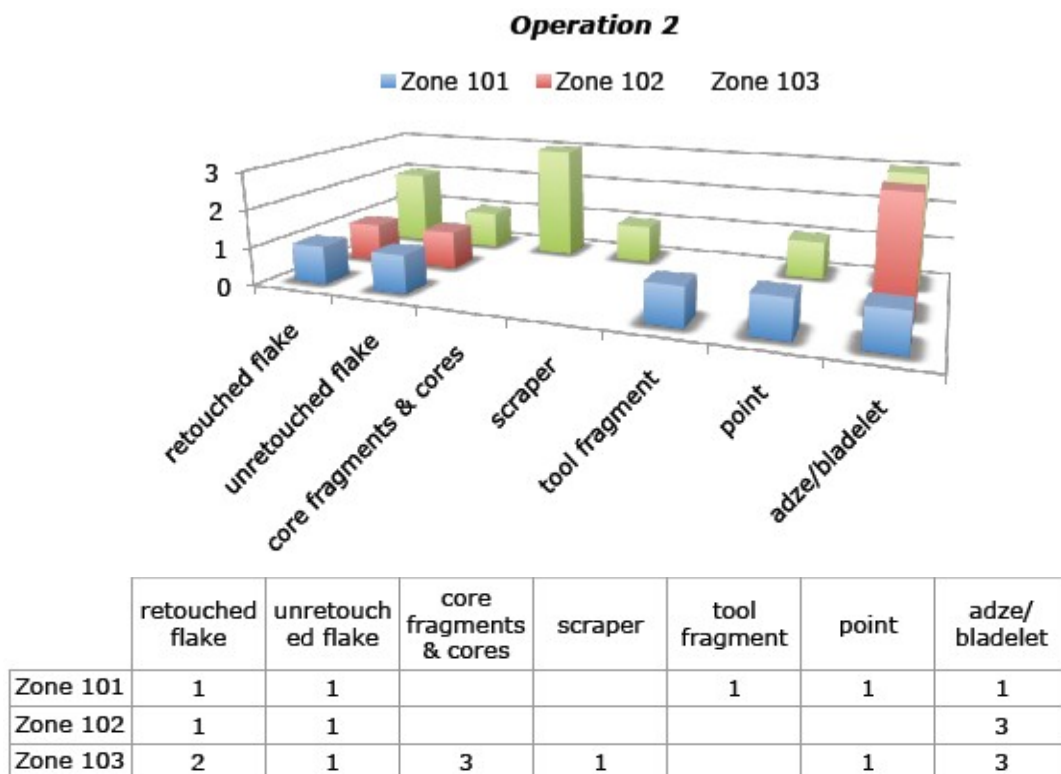


Figure 22: The proportion of lithic categories (n=21), identified by David Cohen as “stone-tools”, from Zone 101, 102 and upper levels of Zone 103 in Operation 2, Botlhano Fela (Figure: Cohen 2009)

Cohen (2009:7) states that points are the dominant tool type in IA/LSA levels at Botlhano Fela, and argues that they can be identified as “one of four traditional types of arrowhead recognized in archaeological assemblages from southern Africa (Goodwin 1945) (...): stone segments mounted in mastic on a wood or bone foreshaft”. The evidence for this artefact type at the Botlhano Fela is, however, not convincing as the photograph of an alleged point depicts a heavily fragmented artefact (see Photograph 1 in Appendix III). The retouched edge and arch that defines the arrowhead in question cannot be readily identified. Therefore, it is argued by the present author that this artefact type is not likely to be identified as an arrowhead. This consequently calls into question the classification of this artefact type in the assemblage.

Additionally, a small number of artefacts in the upper levels of Operation 1 and 3 were referred to by the excavator as “micro-Kombewa flakes and cores” (pers.comm. Cohen 2009; Cohen 2009:5). Kombewa is commonly regarded to be a diagnostic technological reduction technique for the MSA period (e.g. McBrearty 1988; Owen 1938, 1940). Kombewa flakes, with their double bulbed surfaces, are typically larger than the alleged “micro-Kombewa” artefacts in the Botlhano Fela assemblage. For example, the Kombewa cores identified by Owen (1938:204) are about 10 to 15 cm in maximum dimension, in comparison to the “micro-Kombewa” depicted in Photograph 2 in Appendix III, which appear to be about 3 cm. The interpretation of these artefacts as Kombewa is, therefore, also argued by the present author to be questionable. The above examples have considerable implications for Cohen's interpretation of the lithic assemblage in the LSA and IA levels at Botlhano Fela.

7.2 The MSA levels of Botlhano Fela

The following section will provide an assessment of the stratigraphical integrity of the Botlhano Fela site, and post-depositional processes that may have been involved in the formation of the deposits. The stratigraphical integrity of the entire site will be evaluated, both the obviously disturbed units and the assumed undisturbed units, by interpreting various aspects of the deposit and the lithic assemblage. The excavator's assumption of the remaining area as clearly stratified and undisturbed needs to be evaluated before valid interpretations of the assemblage from the MSA levels of Botlhano Fela can be proposed. The latter part of this chapter will, thus, provide an interpretation of the manufacture stages evident in the lithic assemblage, which induces an understanding of the behaviour patterns of the hilltop occupants.

7.2.1 Stratigraphical integrity and post-depositional processes at Botlhano Fela

The presence of the burial uncovered at the base of the two units 1002N 1001E and 1001N 1001E of Operation 2 at Botlhano Fela has contributed to a disturbance of the affected deposit (figure 23). The burial was verified to have been dug into the MSA levels by the observation of a pit running from the stratigraphic Zone 102 to the burial. Consequently, the stratigraphical integrity of these units was not intact. Evidence of significant intermixing in these units was, in particular, confirmed by the refitted denticulate tool found at Level 9 and in the burial, suggesting a maximum vertical movement of more than half a meter between the two pieces (indicated pink in figure 18).

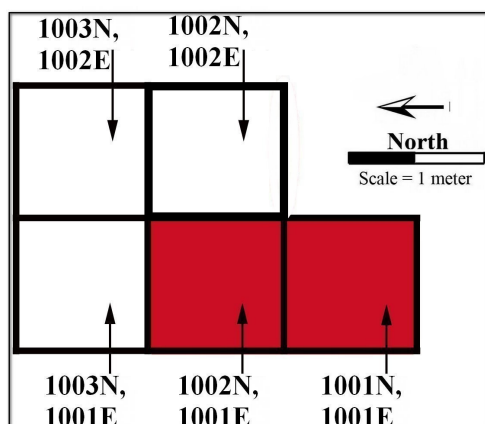


Figure 23: Integrity of the stratigraphic layers of Operation 2 at Botlhano Fela, will be determined by an examination of units affected by burial (indicated in red) and remaining units (Figure: Myrer 2010)

proportion of refitted lithics recovered at different levels constitute about 0,2 % (n = 12) of the total artefact assemblage (n = 6180). This was anticipated due to a limitation on time for the conducted lithic analysis, and also as only a portion of the entire assemblage was accessible (i.e. site not fully excavated, and the horizontal separation of lower and upper assemblage). Despite the modest size of the sample, the displaced refitted lithics are convincing evidence to various levels of movement of at the site – also in the allegedly undisturbed units.

The evidence of a disturbance of the deposit is further supported by ten of the minimum analytical nodules occurring over an extended range of levels in both the undisturbed and disturbed units (see Appendix IV). The extensive dispersal of material in all units is demonstrated by two nodules in particular: “Group A” and “Group J”. While the majority of lithics from the chalcedony nodule “Group A” were recovered in the upper levels the MSA deposit, associated lithic artefacts were also found as deep as Level 24 and in the burial (figure 15). Similarly, lithic material within the brown-yellow agate nodule “Group J” was found ranging from the upper levels to level 21 and in the burial (figure 17). In essence, the measured distance between the related material within the minimum analytical nodules suggests a vertical movement of over half a meter occurring in the supposedly undisturbed units at the Botlhano Fela site.

Furthermore, the stratigraphical integrity of the Botlhano Fela site is accentuated by the occurrence of several LSA and IA diagnostic artefacts in the MSA levels of Operation 2. The excavator acknowledged that the uppermost area of the MSA levels might have basal LSA deposit (pers. comm. Cohen 2007). However, a number of artefacts diagnostic of later periods were recognised at deeper levels in the MSA deposit. A number of knives associated with the LSA period (figure 11:

Cohen considered, however, the deposits and archaeological assemblage of the remaining three units of Operation 2 to be relatively “in-situ” (figure 23). This assumption, which validated the horizontal division of the assemblage, was tested by the current author by the means of determining the vertical distance of refitted artefacts and minimum analytical nodules. In this way, the stratigraphical integrity of all units could be evaluated.

As seen in the previous chapter, the distribution of several refitted sets in this area demonstrate a displacement of material in the alleged undisturbed units. In sum, the

e,f), the large IA scraper (figure 10: h) and grinding-/hammer stone (figure 11: d) were recovered in level 21 to 23, which ranges from about 1, 15 meter to 1, 25 meter into the MSA level. Three micro-blades were also recognised at about 0, 7 meter in the MSA deposit (i.e level 12). This type of débitage, referred to as adze/bladelet by Cohen (2009), were more commonly found in the upper zones of the site, suggesting that these occurrences in the MSA levels could have originated from the above levels. Further, two microlithic segments, both of which are associated with the widely distributed chalcedony débitage of “Group A”, were found in level 9 at 0, 55 meters and in level 13 at 0, 75 meters into the MSA deposit (figure 11: i,j). All of the above diagnostic IA and LSA artefacts, except for one micro-blade, were found in the supposedly pristine units of the site. Of these, only two artefacts were recovered in unit 1003N 1002E, which likely is least affected by disturbance from the LSA burial (figure 23).

The displaced refits, extensive distribution of several minimum analytical nodules and the presence of IA/LSA artefacts all indicate stratigraphic disturbance of the MSA levels at Botlhano Fela – not only in the units related to the burial, as would have been anticipated, but in virtually all of the units. Furthermore, the possibility of an even greater displacement is not to be excluded. The extent of material available for the current analysis was the assemblage from the MSA levels, but there is no reason to suppose that the disturbance is restricted to this deposit.

As a result, one ought to be careful to view the three established stratigraphic zones, although distinctly different in sediment composition and texture, as static entities. The presence of well-defined zones may give a deceptive impression of a relatively undisturbed stratigraphy as vertical displacement is known to occur both within relatively uniform layers and across seemingly different geological layers (e.g. Cahen & Moeyersons 1977; Rowlett & Robbins 1982; Villa 1982). The problem of stratigraphic disturbance in Stone Age sites is a fairly common phenomenon, in particular for open air sites (e.g. Barham 2001; Brooks et al. 1995; Bunn et al. 1980; Cahen & Moeyersons 1977; Kuman 1989; Kuman et al. 2005b; McBrearty 1988; Villa 1982; Yellen 1996; Yellen et al. 2005). The archaeological assemblage may be exposed on the site surface for extended periods of time to post-depositional processes of a human or natural character.

A variety of processes may be suggested to explain the disturbance of the Botlhano Fela deposit:

- 1) Activities by occupants: The pit dug from the upper layers to the base of the site for the LSA burial was relatively easy to identify during excavation. The feature has obviously caused a significant amount of disturbance of the older deposits and a rearrangement of the

archaeological material. However, according to Villa and Courtin (1983:272) there are also several circumstances where digging activities can be hard to identify. For example a short-term utilisation of a pit, if the fill contained perishable material, or if a pit is similar in colour and texture to the surrounding layer.

- 2) Trampling by humans and animals: This kind of occupational disturbance may have been a contributing factor to the displacement of artefacts at the Botlhano Fela site. Trampling must have been a relatively common occurrence on account of the sheer quantity of lithic material suggesting an extensive utilisation of the site. Several experiments have demonstrated that that even with a limited amount of trampling, lithic artefacts can be buried up to 16 centimetres in sandy deposits (e.g. Stockton 1973; Villa & Courtin 1983). These experiments have also proven that fractures and edge damage on lithics could be caused by trampling. This feature is indicated by the significant amount of fractured and weathered lithics in the Botlhano Fela assemblage (Table II in Appendix VI). However, a proportion of the fractures can also attest to other factors, for example knapping accidents during lithic manufacture, thermal fractures, or simply from excavation or bag damage during transportation of the assemblage.
- 3) Thermal alteration: Features such as crazing, colour-change, and “orange peel” were evident in about 2 % ($n = 118$) of the total lithic assemblage from the MSA levels of Botlhano Fela (Table I in Appendix VI). These features indicates an exposure to fire, and were apparent on all raw material types. The thermally altered lithics were evenly distributed throughout the deposit, suggesting that the exposure might derive from for example brief wild fires occurring on the site surface, or possibly hearths from hilltop occupants.
- 4) Floraturbation: The present day environment of the Thamaga hilltop and surrounding area contains a mixture of plants and trees. As seen from Cohen’s wall-drawings, deep-growing roots were commonly seen in the excavation profile of the Botlhano Fela site. Plant roots and tree-fall may have caused mixing of the deposit, but are not easily observed, especially if the remains have decayed (e.g. Villa 1983:271; Wood & Johnson 1978:328-333).
- 5) Alternate wetting and drying: At Botlhano Fela, the lithic material was found distributed with a particular concentration at the lowest levels of the site (figure 8). Cahen and Moeyerson (1977) observed that a basal density of lithic material was a common trait for several open air sites in sandy deposits, as attested by a refitting analysis of an open air site covered by a Kalahari sand mantle. By the means of experiments, they concluded that the dispersal of artefacts may be explained as naturally induced by an environment of alternate wetting and

drying (i.e. percolating rain water and sun) (Cahen & Moeyerson 1977; Wood & Johnson 1978:352-358).

- 6) Alkaline soil: The surrounding alkaline soil may induce staining and degradation of the lithic raw material (Luedtke 1992:100; Rosenfeld 1965:208-213). As demonstrated by the previous chapter, a significant proportion of the assemblage was partially or fully degraded. Also, a modest amount of the lithic material had been stained (see Table III in Appendix VI). Stained material is particularly prominent on cryptocrystalline materials, suggesting a greater susceptibility of these materials to this specific post-depositional process (figure 24). There was no particular concentration of degraded or stained material evident, however, they were distributed throughout the site.

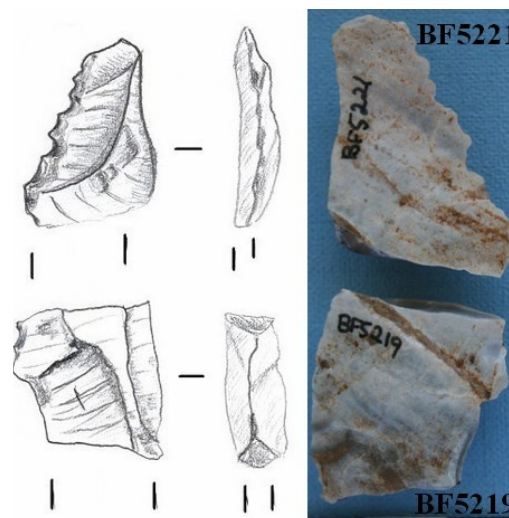


Figure 24: Mended denticulate in agate with stained outer surface. The freshly broken pieces were found at level 23 in unit 1002N 1002E of Operation 2, Botlhano Fela (Photo & drawing: Myrer 2008)

The evaluated post-depositional processes have to varying degrees contributed to affect the original formation of the Botlhano Fela site, and, accordingly, caused corrupted stratigraphic associations of the archaeological assemblage. Although, the demonstrated stratigraphical disturbance of the site is acknowledged, meaningful interpretations can still be made. The refitted sequences also demonstrate that the archaeological record of the site is not in total disarray; the deposit still retains a contextual integrity. For this reason, the lithic assemblage still benefits from a *chaîne opératoire* examination, although with limitations to the application of the approach. The disturbance of the site blurs the distinction between the established layers at the site, and consequently does not permit any fine scaled resolution of archaeological data. Due to the demonstrated disturbance, the deposit must be examined as an entire unit to discern general activity patterns at the Botlhano Fela site.

7.3 Reconstructing the *chaîne opératoires* of Botlhano Fela

The following section provides an interpretation of the partial manufacture stages yielded at the Botlhano Fela site. Each lithic artefact is part of an operational sequence of knapping events from the initial procurement of raw material to modification, use, and eventual discard of artefact.

The reconstruction of the *chaîne opératoires* of the MSA levels of the site provides an in-depth understanding of the assemblage, and ultimately facilitates an interpretation of the general behaviour patterns of the MSA inhabitants at Botlhano Fela. An important focus for MSA research in Botswana is, as mentioned, the role of raw materials in terms of availability in the landscape. For this reason, a particular emphasis in the *chaîne opératoire* examination is on the procurement and usage of raw materials for the lithic manufacture at Botlhano Fela.

7.3.1 *The stages of manufacture*

The number of manufacture sequences from the MSA levels of Operation 2 was broadly estimated, based on the sum of minimum analytical nodules and cores, to approximately 130 nodules in total. Nodules made of cryptocrystalline materials (i.e. jasper, chalcedony and agate) constitute the majority in the assemblage with a total of 45 nodules. The raw materials for the remaining nodules are recognised as 36 quartz nodules, 35 quartzite nodules, and 14 nodules of a degraded or other/undetermined raw material. The large amount of cryptocrystalline nodules compared to quartz nodules is notable when seen in context with the predominant proportion of quartz in the débitage assemblage (see Chapter 6.2.1 Débitage). However, this aspect is suggested to be attributed to the different flaking properties of the raw materials. The flaking pattern of milky quartz produces large amounts of shattered fragments when struck. Consequently, this complicates an interpretation of stages of manufacture for quartz. Information about the identified stages of manufacture at the Botlhano Fela site is, thus, for the most part acquired from the cryptocrystalline and finely-grained quartzite materials.

The large amount of nodules estimated to have been worked at the MSA levels of Botlhano Fela raises questions to the possible provenance of the raw material, how the nodules were transported to the hilltop, and for what purpose (s) the vast number of materials were brought to the site. These questions will be addressed in the following section based on an interpretation of the manufacture sequences represented by the identified nodules. The technological classification of specimens in the Botlhano Fela assemblage clearly demonstrated that all stages of a manufacture sequence are represented at the site. Traces of various stages of manufacture were related to many of the

estimated nodules, but a complete sequence was never found. This was anticipated as the Botlhano Fela site was not fully excavated, and also the assemblage from Operation 2 was separated between two independent research studies. For this reason, it is likely that portions of a manufacture sequence can be found in the alleged IA/LSA levels of Operation 2 or other areas of the Botlhano Fela, and must be considered when interpreting the lithic assemblage.

7.3.2 Procurement of raw material

The description of the geological setting of the Metsemotlhaba River valley confirms the availability of suitable raw materials for lithic manufacture (see Chapter 3). The various raw materials identified in the Botlhano Fela assemblage have, therefore, most likely been obtained from nearby sources. Most cores were made on rolled cobble and pebbles as indicated by the mechanically rounded outer weathered surface, and proposes an alluvial origin of the material (Andrefsky 2007:103). This observation corresponds with the abundant cobbles found in the bends of major watercourses in the surrounding area, the closest one being the ephemeral Metsemotlhaba River along the edge of the Thamaga village (figure 2).

A few specimens in the lithic assemblage, particularly quartz, exhibit an angular outer surface. This feature indicates that the quartz material could, in addition to have been gathered as cobbles from river deposits, also originate from outcrops in the form of veins. As described in Chapter 3, vein quartz is locally available in the Waterberg and Transvaal sediments covering the basement rocks of the area. Local outcrops and river deposits are, therefore, thought to be potential sources for the nodules found at the Botlhano Fela site, and indicate to a relatively short distance of transportation for the utilized raw material.

7.3.3 Initial and middle stages of manufacture

The initial and middle stages of manufacture in the Botlhano Fela assemblage are recognised from material remains resulting from the preparation of nodules, and subsequent production of flakes and other types of débitage. In general, a substantial amount of outer weathered surface on a lithic artefact is commonly considered indicative of the early stages in a manufacture sequence (Andrefsky 2007:104; Odell 2003:126-127). The proportion of outer weathered surface was, thus, recorded for each lithic artefact ranging from an entire coverage (100%) to no (0%) remains on the dorsal surface of the artefact (table 7).

Proportion of outer weathered surface							
Raw material	Quartz		Quartzite		Cryptocrystalline		TOTAL
Proportion	Finds	%	Finds	%	Finds	%	Finds %
0%	1708	76%	875	66%	1262	67%	3845 71%
1 – 20%	409	18%	281	21%	420	22%	1110 20%
21 – 40%	73	3%	94	7%	108	6%	275 5%
41 – 60%	31	1%	48	4%	72	4%	151 3%
61 – 80%	9	0%	17	1%	28	2%	54 1%
81 – 99%	6	0%	2	0%	1	0%	9 0%
100%	1	0%	0	0%	0	0%	1 0%
TOTAL	2237	100%	1317	100%	1891	100%	5445 100%

Table 7: Proportion of outer weathered surface for lithic artefacts (n = 5445*) in the assemblage, according to raw material types, from Operation 2, Botlhano Fela. *The variable was not recorded for fully degraded raw materials, and other/undetermined raw materials. (Table: Myrer 2009)

As seen from table 7, approximately a third of the total lithic assemblage (29%) have remnants of outer weathered surface. The recorded proportion of lithics from the initial stages of a manufacture sequence is similar for quartzite and cryptocrystalline materials, and suggests that the nodules were most likely partially prepared before transported to the hilltop. No or little elaborate detachments of nodules appear to have occurred at the site since lithics covered with large amounts of outer weathered surface (>61 %) are hardly present in the assemblage. Considering the fact that the nodules in the assemblage appear to have been relatively small to medium sized, it may not have been necessary to do extensive initial detachments of the outer surface at the sourcing site before transporting cobbles to the hilltop (see Table IV in Appendix VI). The quartz material has, however, a larger proportion of lithics without remnants of outer surface in contrast to the other material types. This could be explained, as previously mentioned, by the procurement of quartz from vein sources.

The occurrence of knapping from the initial or middle stages of manufacture at the Botlhano Fela site is, further, indicated by a number of conjoined refits and minimum analytical nodules. Three cores were conjoined to flakes with presence of outer weathered surface, as presented in figure 19 and 21, confirming that the initial detachment of these particular cores took place at the site. The cryptocrystalline *Levallois* core in figure 21 has also, with the application of minimum analytical nodule analysis, been associated to a substantial amount of débitage (n = 12) grouped to minimum analytical nodule “Group K” (see Appendix IV). The majority of débitage within this minimum analytical nodule has remnants of outer weathered surface, and is, therefore, interpreted to be the initial knapping products from the cryptocrystalline *Levallois* core detached at the site.

The core types identified in the assemblage demonstrate various technological approaches for detaching lithics at the Botlhano Fela site. The various approaches for detachment is largely utilised for the manufacture of possible blanks in the form of flakes. There appears to be an emphasis on the working of amorphous cores. The single platform approach was utilised for both flake and micro-blade production. However, the latter was determined to be diagnostic of the LSA and Early IA period. The third identified approach for detaching lithics is the *Levallois* technology, which appear to have been utilised for production of a series of pre-shaped flakes. A modest sample of discoidal cores, related to the production of corner-struck unifacial points, was recognised in the assemblage. All technological approaches for detaching lithics, except for discoidal cores which was not found in cryptocrystalline materials, appear to have been applied on all types of raw material.

7.3.4 Modification

The material remains from the partial manufacture stages related to the modification of blanks are for example retouch débitage, incomplete and complete tools. Little or no outer weathered surface on a lithic artefact is generally indicative of the later stages in a sequence. As seen from table 7, the majority of the lithic assemblage (71 %) has no remnants of outer weathered surface. The high proportion suggests that knapping and subsequent production of tools occurred to a large extent at the site. However, the number of tools identified in the MSA levels of Operation 2 at Botlhano Fela is modest (about 1 %). Although, as demonstrated in Chapter 2, this appear to be a common feature for several MSA sites.

A possible explanation to the low proportion of tools can be that the goal of manufacture was not always to achieve a finished form, but could have been to produce flakes for immediate utilisation. This is particularly notable in the near absence of retouched quartz tools (see Table 5), despite the large quantities of the raw material at the site. Three quartz tools were recognised in the lithic assemblage, i.e. a scraper, denticulate and unifacial point, and these were produced on a fine-quality quartz (figure 10: c, g). As mentioned earlier, the low number of quartz tools could be evident of the different flaking properties of quartz compared to the other raw material types. Additionally, a number of tools produced at the site could most likely have been transported elsewhere. However, the latter argument cannot be substantiated because complete manufacture sequences were, as mentioned, never found in the MSA levels of the site.

A small number of partial manufacture sequences were assembled from the Botlhano Fela MSA levels, by conjoined refits and minimum analytical nodules, that give indications to the production of tools at the site. For example, the minimum analytical quartzite nodule “Group F” yielded both refitted artefacts and associated débitage ($n = 2$) (see Appendix IV; figure 20). Within this nodule group, a conjoined refit of a preform of a tool and a hinged flake confirms that the artefact was manufactured at the site. The preform has five moderately invasive removals on the ventral surface suggesting that the intention of the knapper could have been to produce a unifacial tool.

Several minimum analytical nodules consisting of tools and associated débitage were also interpreted to indicate tool manufacture at the site, although, no conjoined refits were made between the tools and débitage within the nodule. For example, a denticulate tool was associated with a number of débitage materials ($n = 10$) within agate and jasper nodule “Group I” (Appendix IV; figure 13). A second denticulate tool in agate was associated with several flakes and debris ($n = 7$) within the established minimum analytical nodule “Group D” (Appendix IV; figure 10: f). The above-mentioned examples on manufacture sequences based on refitted material and minimum analytical nodules confirms the interpretation of various types of tools being manufactured at the Botlhano Fela site.

Based on the modest sample of tools in the assemblage, the retouched tools appear to largely have been made on cryptocrystalline materials and finely-grained quartzite. The predominant proportion suggests a preference of these materials for this particular purpose, which possibly reflects the ease of working cryptocrystalline and quartzite materials. Finely-grained quartzite appear to have been favoured for the production of *Levallois* points. This material is less brittle than the cryptocrystalline materials, but eliminates the need for retouching as it provides a more durable edge (Murphy 1999:173). Corner-struck unifacial points, attributed to the discoidal technique, were found in chalcedony and quartz. However, the discoidal cores identified in the assemblage were not found in cryptocrystalline material types, suggesting that the chalcedony points could have been brought to the site. Another possibility is, as mentioned earlier, that portions of the particular manufacture sequence could be found at other areas or in the IA/LSA levels of the site.

7.3.5 Discard

A large proportion of artefacts in the assemblage was, as mentioned, fractured due to post-depositional processes or bag damage. However, other possible causes to fracture can originate

from utilisation or during manufacture of artefacts. For example, fracture during utilisation is interpreted to have been the cause of abandonment for a denticulated tool (figure 10: f). The fractured proximal end of the artefact might relate to the possible hafting as indicated by bulbar thinning. Another example, the unifacial preform is argued to be discarded during manufacture (figure 20). A hinged removal was determined on the preform, and this knapping error likely caused the abandonment of the incomplete tool. In the above examples, it is apparent that the artefacts were intentionally discarded because they were fractured.

Summary;

During the excavation, the site of Botlhano Fela was interpreted by the excavator, David Cohen, to consist of three different stratigraphic layers - Zone 101, 102 and 103. The assemblages from the upper IA/LSA levels and MSA levels were examined in two separate studies based on Cohen's assumption of a relatively undisturbed site. The results of Cohen's analysis of the IA/LSA levels indicate that the raw materials utilised during those periods were predominantly quartz, cryptocrystalline and quartzite materials. The lithic assemblage comprised of a few tools, which were interpreted by Cohen to be diagnostic of the LSA and IA. However, the classification of several of these artefacts were questioned by the present author.

In addition, the stratigraphic integrity of the site is debatable. A significant displacement of materials was determined in all units, both the alleged undisturbed and disturbed units, with reference to minimum analytical nodule analysis and application of the refitting method. Additionally, a number of lithic artefacts diagnostic of the LSA and IA periods were found well within the MSA levels. The stratigraphical disturbance of the Botlhano Fela site was likely to have been caused by a range of post-depositional factors.

The attested disturbance of stratigraphical layers have implications for the analysis of the lithic material, when considering that the lithic assemblage was separated horizontally by the excavator for the purpose of two studies. A lithic analysis of a partial assemblage is not ideal for the application of a *chaîne opératoire* approach. These restrictions were taken into account in the further interpretation of the assemblage. General features of the lithic assemblage indicate that the wide range of raw materials was locally obtained from rivers and other sources situated in the valley. A large volume of partially prepared nodules was transported to the hilltop for the purpose of tool manufacture. At the site, there are traces of all stages of manufacture, from the initial

removals to the final artefact, with the middle sections of the knapping sequences dominating the assemblage. In most cases it was not possible to establish what was produced, as there was no full sequence of manufacture to be found. The manufacture of a large number of flakes for expedient use most likely occurred at the site, while only a few retouched tools, such as denticulates and a possible unifacial tool, were demonstrated to have been produced at the site. It is possible that a great number of tools were made at the site, as demonstrated by the numerous débitage materials in the lithic assemblage. These tools could have been exported to other sites, or a portion could potentially be found at other areas of the site. The modest number of retouched tools found at the site was commonly found in cryptocrystalline and finely-grained quartzite materials, as these materials possibly were best suited for this purpose. The tools at the site were discarded for various reasons, either as they were deemed not usable or needed any more.

8: Summary and conclusions

The Berkeley-Botswana Archaeological Project was initiated in 2003 to conduct research in the Metsemotlhaba River valley in south-east Botswana. One of the main goals of the project was initially to provide additional evidence to the on-going “Kalahari debate”. The preliminary surveys of the valley located a number of archaeological sites, of which the Botlhano Fela site on Thamaga Hill, interpreted to be associated with farmers, was selected for further excavation in the 2007 field season. However, an extended perspective for research emerged as the excavations produced not only IA and LSA material, but the lowest levels of Operation 2 at Botlhano Fela unexpectedly yielded lithic material diagnostic of the MSA period. The site was assumed by David Cohen, the excavator, to be stratified and undisturbed, except for the two units that yielded an LSA burial. This assumption warranted the excavator’s decision to consider the lithic assemblage of the site as two separate entities. The upper IA/LSA levels formed the basis for Cohen’s research, while the lithic material from the lower MSA deposit were assigned to the present author.

An open air site with a deep sequence spanning from the IA and LSA to the MSA period is not commonly found in Botswana. In this sense, the stratigraphic Botlhano Fela assemblage is valuable as it provides new insight into the Stone Age sequence in the south-eastern Botswana, especially given the rarity of MSA sites in stratified contexts.

- Hence, the first aim of the analysis of the Botlhano Fela MSA levels intended to determine the characteristics of the lithic assemblage, as no excavated MSA assemblage in south-eastern Botswana has yet been described in detail. Subsequently, the description of the Botlhano Fela assemblage intended to draw comparisons with more fully documented areas in the north-western Botswana and the adjacent Limpopo Province of South Africa.
- The second research goal was to determine the behaviour patterns evident in the Botlhano Fela MSA lithic material. The subject of raw material procurement and availability was particularly emphasised, as this is a principal research question for MSA in Botswana.

The material basis for the current thesis is, as stated, the MSA deposit of Operation 2 at Botlhano Fela. The theoretical framework and methodological approach of the *chaîne opératoire* was used in conjunction with typological and technological analysis, to examine this body of material. The approach would additionally allow for an assessment of the site's stratigraphical integrity.

Firstly, the results of the analysis of the MSA deposit demonstrated that all units, also in the units not associated with the burial, in all probability were significantly disturbed. Although, the extent of the current lithic analysis was confined to the MSA deposit, the lack of stratigraphic integrity is likely to be similar in the upper IA and LSA levels of Botlhano Fela. Given the corrupted stratigraphic associations of the assemblage, the decision by Cohen to separate the lithic assemblage posed analytical and interpretive problems. As the set of stratigraphic associated materials provide the basic unit for the analysis, the level of disturbance will have implications for the interpretation of the archaeological material – in both the IA/LSA levels, and the MSA levels of the Botlhano Fela site. Although, the division of the assemblage was executed by Cohen with the best intentions - the IA/LSA and MSA deposit should, ideally, have been examined jointly. However, valuable interpretations could still be made, as the refitted sets also demonstrated that the deposit was not in a complete disorder.

Moreover, the description of the lithic assemblage from the lower deposit determined that the site definitely has a MSA component, as diagnostic MSA artefacts in the Botlhano Fela assemblage are distinctive elements of the deposit. The artefacts, in particular side-struck unifacial points, discoidal cores, *Levallois* points and cores, are equivalent of artefacts found at other MSA sites in north-western Botswana, as well as Limpopo Province of South Africa. The Botlhano Fela site can, therefore, be incorporated into the scarce record of MSA sites in Botswana. Although the MSA levels of Botlhano Fela site has not been dated, other MSA assemblages in the north-western Botswana are being shown to date to between approximately 50 000 and at least 95 000 years ago (see Table 1). Therefore, it is probable that the MSA occupation at the Botlhano Fela site falls somewhere in this period.

Further examination of the Botlhano Fela assemblage allowed for interpretations of general behaviour patterns of the hilltop occupants. The large volume of lithic materials was separated into various raw material types, and subsequently into minimum analytical nodules, which

allowed for the possibility of determining manufacture sequences. A full manufacture chain was never found, although, the description of lithic categories demonstrated that the lithic assemblage comprised of products of all stages. A large number of nodules in a wide variety of raw materials were shown to have been used by the inhabitants of the hilltop. The raw materials were most likely gathered from riverbanks or other sources in vicinity of the site, thereby, did not have to be transported or traded over large distances. This suggested that the hilltop occupants knew the surrounding area well. The close availability of resources, such as an ample access to raw materials, water in the ephemeral rivers and fauna, is likely to have been of importance for the settlement location on the fringe of the Kalahari. Initial minor detachments of the nodules were made before transportation to the hilltop, where knapping activity and tool manufacture occurred.

The assemblage is largely based on the reliance of flake-tools and the use of amorphous, *Levallois* and discoidal techniques to produce flakes. Tools make up only a modest amount of the assemblage, which is a common feature for several MSA sites. However, it is possible that a number of tools were produced at the hilltop, judging by the large amount of waste materials. As complete manufacture sequences were never found, thus, it is not possible in most cases to constitute what was manufactured. Although, partial manufacture stages were determined for denticulates and a possible unifacial tool, indicating that these particular tools were produced at the site. The majority of tools recognised at the site was produced in cryptocrystalline or other finely-grained materials, indicating a preference of these materials for this purpose. The large volume of lithics evidences considerable activity at the hilltop site, however, due to the intermixing of the deposit, the exact duration for this period of occupation remains an open question. The examination of the Botlhano Fela assemblage have already yielded interesting features of the behavioural patterns of the MSA occupants on the hilltop. Considering that the excavated areas show that a significant deposit covers an extensive part of the site, despite only a minor part is investigated, this indicates an ample potential for further studies.

Extensive research on the MSA period is yet to be undertaken in south-eastern Botswana. Stone Age research has developed slowly, and is poorly known in comparison to other periods. Much of the MSA framework derives from the few excavated and published cave and pan sites in north-western Botswana and South Africa largely due to long sequences and well-preserved deposits. This reflects a biased focus for the MSA research. At the open air

site of Botlhano Fela, not a single MSA artefact was found on the surface. One would not know that the MSA peoples were in the area at all were it not for deep excavations, and the initial recognition of diagnostic MSA artefacts by David Cohen. This discovery, in addition to the recently discovered MSA component of the open air site of Toteng, may, therefore, have facilitated the research potential of areas in Botswana that previously were overlooked. The lithic study of the Botlhano Fela site presented in the thesis, as such, should encourage a greater appreciation of the contribution which open air sites, and particularly hilltop sites, can make to southern African Stone Age studies. Additionally, the application of the *chaîne opératoire* approach in contrast to other traditional methodologies, has been beneficial for the results and interpretation of the open air site. Without this particular approach, the stratigraphical disturbance at the Botlhano Fela site would have been uncontested, and in consequence have influenced the site interpretation. This testifies to the importance of the *chaîne opératoire* as a research method, suggesting that it should be a common practice in southern African archaeology.

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APPENDIX:

I: Glossary, II: Diagnostic artefacts, III: Lithic artefacts from the IA/LSA levels of Botlhano Fela, IV: Minimum Analytical Nodules, V: Database, VI: Tables.

I: Glossary:

The following glossary includes a brief definition of the established Stone Age periods and the range of artefact types and cores analysed in this study. These are based on definitions from Kuman (1989) and Murphy (1999).

Early Stone Age dates from about 2 million years ago, and refers to the appearance of the first stone tools – Oldowan and Acheulian technology.

Middle Stone Age dates from about 200 000 years ago, and is defined by a shift in technology to prepared core techniques to manufacture flakes.

Later Stone Age dates from about 30 000 to 200 years ago, is generally characterised by the appearance of microlithic technologies.

Débitage refers to all types of waste material during a lithic reduction process. This assemblage includes: flakes, debris, preforms, shatter etc.

Flake is a complete or fragmented piece with a distinguishable dorsal and ventral surface

Debris does not possess an identifiable butt or a clearly distinguishable dorsal or ventral surface.

Preform is the incomplete and unused form of a lithic artefact.

Core is a stone (i.e. cobble, pebble, block, nodule etc.) which have served for the systematic detachment of two or more flakes.

Levallois core is a core that appears to have been set up for the production of flakes with two intersecting surfaces – one being the striking platform and the other production surface.

Discoidal core is systematically detached from multiple platforms around the circumference towards the centre. The cores are commonly worked on two intersecting surfaces – both for striking platform and production surface. The plane of detachment is secant, in comparison to the *Levallois* core which has a parallel detachment plane.

Amorphous or **multi-platform core** has three or more striking platforms oriented on different planes.

Single platform core has one major platform from where flakes are detached in one direction.

Kombewa core is a large flake from where flakes are struck on the ventral surface.

Tool is an artefact that has been deliberately modified.

Scraper has a flat ventral surface and a retouched convex edge.

Point is a flake with two converging sides to give the artefact a pointed form.

Unifacial point has invasive retouch on one surface, usually the dorsal surface

Bifacial point has invasive retouch on both surfaces.

Levallois point has converging flake scars coming to a point at the distal end.

Denticulated point has retouch along both edges to produce a denticulated form.

Knife has retouch along either one (unilateral) or two (bilateral) straight edges.

Denticulate is a flake with denticulate retouch.

Borer is a flake with retouch to produce a point for boring. Ideally polish would be present at the “business” side.

Micro-blade is a micro-flake with more or less parallel edges, and is twice as long as wide.

Segment is a flake or part of a micro-blade that has a straight, sharp edge opposite to a curved arc backed by abrupt retouch. Also referred to as geometrics.

Miscellaneous retouched piece (MRP) is a term used for artefacts which show minor or dubious retouch, but cannot clearly be categorised to any formal tool class.

Grinding stone has one or more surfaces with signs of smoothing or pecking.

Hammer stone is commonly identified by an oval shape and battering marks from being used to detach flakes from a core.

II: Diagnostic retouched points

Illustrations of diagnostic tool types referred to in the present thesis: Bifacial and unifacial points from #Gi, Botswana

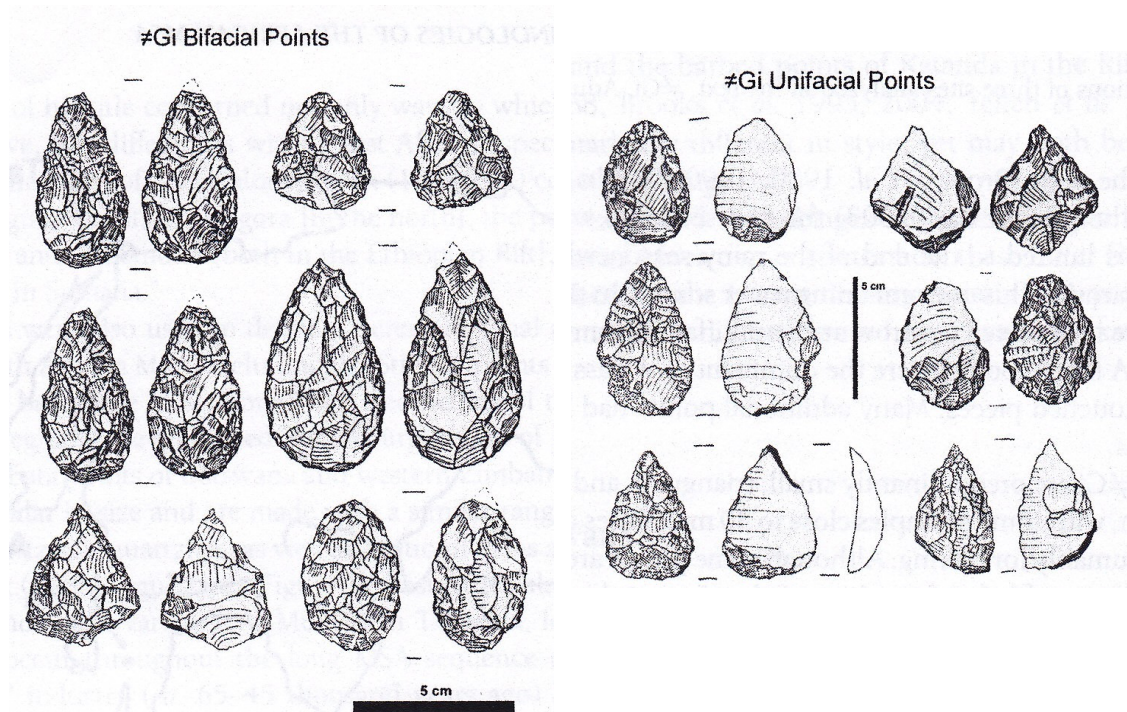


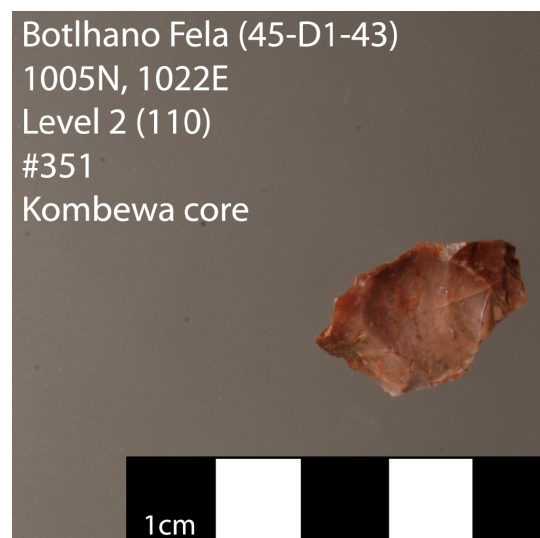
Illustration 1: #Gi bifacially and unifacially retouched points (After: Brooks et al. 2006:238; Edit: Myrer 2010)

III: Lithic artefacts from the IA/LSA levels of Botlhano Fela

Photographs of lithic categories as classified by David Cohen:



Photograph 1: Fragmented lithic artefact from the IA/LSA levels of Botlhano Fela defined as a point by David Cohen (Photo: Cohen 2008)



Photograph 2: Lithic artefact from the IA/LSA levels of Botlhano Fela defined as a Kombewa core by Cohen (Photo: Cohen 2008)

IV: Minimum Analytical Nodules

The horizontal (unit) and vertical (level) distribution of the minimum analytical nodules, including a description of the nodule-features. The “disturbed” units (i.e. 1001N, 1001E and 1002N 1001E) are highlighted in orange. Refitted material is indicated in bold font.

Group A: Chalcedony with a varying degree of degradation

<i>Level</i>	<i>Unit</i>	<i>Lithic ID</i>
Level 9:	(1001N 1001E)	BF79, 90
	(1002N 1001E)	BF138, 143, 151
	(1002N 1002E)	BF26, 29, 34, 38, 39, 41, 43, 47, 48, 49, 50, 51, 52, 53, 55, 56, 69
	(1003N 1001E)	BF163, 164, 165, 169, 177, 179, 184, 185, 187
Level 10:	(1001N 1001E)	BF447, 451, 454
	(1002N 1001E)	BF529, 554, 568, 573 , 575
	(1002N 1002E)	BF485, 509
	(1003N 1001E)	BF290
	(1003N 1002E)	BF324, 325, 341
Level 11:	(1001N 1001E)	BF664
	(1002N 1001E)	BF682, 683
	(1002N 1002E)	BF758, 770
Level 12:	(1001N 1001E)	BF1258, 1262, 1266, 1277, 1279, 1287
	(1002N 1001E)	BF1351 , 1352, 1354, 1378
	(1002N 1002E)	BF1424, 1436, 1438, 1442
	(1003N 1001E)	BF1555, 1596, 1607, 1609
	(1003N 1002E)	BF1674
Level 13:	(1001N 1001E)	BF1802
	(1002N 1001E)	BF1851, 1856, 1878
	(1003N 1001E)	BF1939, 1953, 1960
	(1003N 1002E)	BF2149
Level 14:	(1002N 1001E)	BF2280, 2284, 2297, 2299, 2360, 2398, 2414, 2431
	(1002N 1002E)	BF2492
	(1003N 1002E)	BF2586, 2589
Level 16:	(1002N 1001E)	BF2864, 2883
Level 24:	(1002N 1002E)	BF5549, 5565
Burial I:	(Burial I)	BF6107, 6111, 6112, 6141

Group B: Moss agate in distinguishable broad flakes

<i>Level</i>	<i>Unit</i>	<i>Lithic ID</i>
Level 9:	(1001N 1001E)	BF72
Level 10:	(1002N 1002E)	BF507
	(1003N 1001E)	BF305
	(1003N 1002E)	BF319
Level 14:	(1002N 1001E)	BF2269
	(1003N 1002E)	BF2571

Group C: Metamorphic rock in dark grey colour with small crystal inclusions

<i>Level</i>	<i>Unit</i>	<i>Lithic ID</i>
Level 9:	(1001N 1001E)	BF89
	(1002N 1001E)	BF118, 137, 141
	(1002N 1002E)	BF4, 6
	(1003N 1001E)	BF158

Level 10: (1001N 1001E) BF461, 462
 (1002N 1002E) BF446
 Level 12: (1003N 1001E) BF1516
 Level 22: (1002N 1002E) BF4400
 Level 23: (1002N 1002E) BF5086

Group D: Jasper/agate in a mix of dark red, grey and opaque white colour

Level	Unit	Lithic ID
Level 11:	(1002N 1001E)	BF676
	(1002N 1002E)	BF782
	(1003N 1002E)	BF970, 1150, 1244
Level 19:	(1002N 1002E)	BF3286, 3288
Level 21:	(1002N 1002E)	BF3838
Level 24:	(1002N 1002E)	BF5649

Group E: Tan/grey coarse-grained quartzite with dark spots

Level	Unit	Lithic ID
Level 12:	(1002N 1001E)	BF1362
Level 15:	(1002N 1002E)	BF2672
Level 23:	(1002N 1002E)	BF5090, 5091

Group F: Light grey quartzite with yellow spots

Level	Unit	Lithic ID
Level 10:	(1003N 1001E)	BF209
Level 12:	(1002N 1002E)	BF1404
Level 16:	(1002N 1001E)	BF2853
Level 22:	(1002N 1002E)	BF4208

Group G: Dark grey and red banded jasper

Level	Unit	Lithic ID
Level 13:	(1002N 1001E)	BF1829
	(1002N 1002E)	BF1890
Level 18:	(1002N 1002E)	BF3160

Group H: Grey quartzite with round outer surface

Level	Unit	Lithic ID
Level 21:	(1002N 1002E)	BF3538, 4205, 4209
Level 23:	(1002N 1002E)	BF5021
Level 24:	(1002N 1002E)	BF5839, 5856

Group I: Agate/jasper conglomerate in dark red and white colour

Level	Unit	Lithic ID
Level 9:	(1002N 1001E)	BF122, 133
Level 12:	(1002N 1001E)	BF1325
Level 13:	(1001N 1001E)	BF1789
	(1002N 1001E)	BF1822, 1825
Level 14:	(1002N 1001E)	BF1298, 2401
Level 15:	(1003N 1002E)	BF2795
Burial I:	(Burial I)	BF6097 , 6100, 6104

Group J: Orange/brown agate with dark outer surface

Level Unit Lithic ID

Level 12: (1002N 1001E) BF1373

Level 13: (1002N 1001E) BF1860, 1950

Level 14: (1002N 1002E) BF2450

Level 16: (1002N 1001E) BF2836, 2909

Level 18: (1002N 1002E) BF3163

Level 21: (1002N 1002E) BF3746

Burial I: (Burial I) BF6152

Group K: Agate/jasper conglomerate group

Level Unit Lithic ID

Burial I: (Burial I) BF6038 - 6050

Group L: Finely grained red/orange quartzite

Level Unit Lithic ID

Burial I: (Burial I) BF5977, 5979

Group M: Black agate with cream stains

Level Unit Lithic ID

Level 24: (1002N 1002E) BF5524, 5525, 5551

V: Database

An outline of all variables in the three tables: “Finds”, “Cores” and “Tools”, created in an Access database (“BF2007 Lithics DB”). The different variables are underlined and explained in short.

Table: “Finds”

“LID”: a unique ID for the artefact, e.g. BF5076

“Unit”: the horizontal 1x1 meter area of excavation where the artefact was found, e.g. 1003N, 1001E

“Layer”: the vertical area (5 cm) of excavation, e.g. L19

”Type”: The artefact was divided into five types: "Flake";"Blade";"Core";
"Tool";"Other/Undet."

“Section”: Completeness of lithic artefact, ranging from "Complete", "Proximal", "Proximal to Medial", "Medial", "Distal to Medial", "Distal" to "Incomplete/Unknown"

“Raw material”: Identification of main raw material groups, and certain groups were further subdivided based on colours: "Grey quartzite";"Red qzite";"Tan qzite";"Other qzite";"Quartz";"Rock crystal qtz";"Rose qtz";"Smoky qtz";"Agate";"Red jasper";"White chalcedony";"Grey Chalcedony";"Ochre";"Degraded";"Other/Undet."

“Retouch”: “Yes” or “No”

”Thermally altered”: “Yes” or “No”

”Amount of outer surface (%)”: Percentage of visible outer surface from "0";"1-20";"21-40";"41-60";"61-80";"81-99";"100"

”Refits with”: Entered if the lithic artefact refits with other lithics in the collection.

”Unaltered manuport”: Entered if the lithic artefact has no features indicating human alteration.

”Macro photo”: “Yes” or “No”

”Illustrated”: “Yes” or “No”

”Comments”: Other features not included in the variables above. E.g.: Cortex type (cobble, outcrop, rind), termination (hinged, plunged, feathered, stepped), type and features of thermal alteration (warm, cold), butt type/shape, staining etc.

Table: “Tools”

“LID”: a unique ID for the artefact.

“Tool-type”: Each tool is further categorized into e.g. scraper, point, blade, knife etc.

“Max length (cm)”: Max dimension in any direction.

“Max width (cm)”: Max dimension perpendicular to length.

“Butt shape”: "flat"; "concave"; "convex"; "chapeau de gendarme"; "missing"; "irregular"

“Butt type”: "plain"; "faceted/prepared"; "corticated"; "dihedral"; "no butt"; "unknown/undet."

“Retouch”: “Yes” or “No”

“Retouch position”: "distal ventral"; "lateral right ventral"; "lateral right dorsal"; "lateral right bifacial"; "lateral left ventral"; "lateral left dorsal"; "lateral left bifacial"; "distal dorsal"; "distal bifacial"; "proximal dorsal"; "proximal bulbar"; "proximal bifacial"; "complete unifacial dorsal"; "complete unifacial ventral"; "complete bifacial"; "unknown/undet." ref.:Minichillo database.

“Retouch type”: "normal"; "sub-parallel"; "parallel"; "fine and very fine"; "invasive"; "notch"; "denticulate"; "unknown/undet."

“Angle of removals”: "abrupt"; "semi-abrupt"; "moderately invasive"; "unknown/undet."

“Curvature of retouch”: "convex"; "concave"; "irregular"; "regular"; "rectilinear"; "unknown/undet."

“Comments”: e.g. termination (hinged, plunged, feathered or stepped), staining etc.

Table: “Cores”

“LID”: is a unique ID for the artefact.

“Core-type”: "core on a flake"; "minimal core"; "core prepared for one major removal"; "change of orientation core"; "discoidal core"; "adjacent platform core"; "single platform core"; "core with opposed platforms on same side"; "core with opposed platforms on opposite sides"; "core with opposed platforms on same and opposite s"; "other double platform core"; "cylinder core"; "unknown/undet."

“Max length (cm)”: Maximum dimension in any direction.

“Max width (cm)”: Opposite direction of maximum dimension.

“Nb of removals”: Only removals larger than 10mm were counted.

“Type of platform”: "plain"; "faceted"; "corticated"; "unknown/undet."

“Comments”: e.g. cortex type, platform etc., knapping errors (hinged, plunged, feathered or stepped), staining etc.

VI: Tables

Following tables presents recorded variables of the lithic assemblage from Operation 2 at Botlhano Fela:

Thermal alteration		
Raw material	Number	%
Jasper	18	15,3%
Degraded	8	6,8%
Quartzite	36	30,5%
Agate	41	34,7%
Chalcedony	14	11,9%
Other/Undetermined	1	0,8%
Total thermally altered	118	100,0%
Total assemblage	6180	1,9%

Table I: Amount of thermally altered lithics, and the proportion of thermal alteration for the total assemblage of the MSA levels of Operation 2, Botlhano Fela (Table: Myrer 2010)

Fragmentation		
Section	Number	%
Complete	671	10,9%
Incomplete/unknown	3030	49,0%
Proximal to medial	985	15,9%
Medial	622	10,1%
Distal to medial	847	13,7%
Distal	9	0,1%
Proximal	16	0,3%
Total	6180	100,0%

Table II: Proportions of fragmented lithics, ranged in completeness, in the lithic assemblage from MSA levels of Operation 2, Botlhano Fela (Table: Myrer 2010)

Stained material		
Raw material	Number	%
Agate	10	71,4%
Jasper	2	14,3%
Quartz	1	7,1%
Quartzite	1	7,1%
Total stained	14	100,0%
Total assemblage	6180	0,2%

Table III: Amount of stained lithics grouped per raw material type, and the proportion of stained lithics for the total assemblage of the MSA levels of Operation 2, Botlhano Fela (Table: Myrer 2010)

Dimensions of cores									
Core type	Amorphous		Single platform		Levallois		Discoidal		
Centimeters	Length	Width	Length	Width	Length	Width	Length	Width	
1	0	7	0	5	0	14	0	1	
2	1	22	2	26	1	6	0	1	
3	14	10	10	7	2	3	1	1	
4	16	4	16	0	11	0	0	0	
5	9	1	9	1	5	0	1	0	
6	3	0	2	0	2	0	1	0	
7	1	0	0	0	1	0	0	0	
8	0	0	0	0	1	0	0	0	
Total cores	48	48	37	37	21	21	3	3	
Mean dimens.	4	2	4	2	4,5	1,5	4,7	2	

Table IV: Dimensions of the core assemblage, in length and width (cm), from the MSA levels of Operation 2, Botlhano Fela (Table: Myrer 2010)

Mended refits							
LID	Type	Unit	Level Refits with: (LID)		Unit	Level	
Undisturbed units							
BF1964	Debris	1003N, 1001E	L13	BF1987	Debris	1003N, 1001E	L13
BF2686	Tool (proximal)	1002N, 1002E	L15	BF2712	Tool (medial)	1002N, 1002E	L15
BF3015	Flake (proximal)	1002N, 1002E	L17	BF3037	Flake (medial)	1002N, 1002E	L17
BF3251	Flake (medial)	1002N, 1002E	L19	BF3284	Flake (distal)	1002N, 1002E	L19
BF3286	Flake (distal)	1002N, 1002E	L19	BF3288	Flake (proximal)	1002N, 1002E	L19
BF3295	Flake (proximal)	1002N, 1002E	L19	BF3309	Flake (medial)	1002N, 1002E	L19
BF3342	Core (fractures)	1002N, 1002E	L19	BF3343, 3344	Core (fractures)	1002N, 1002E	L19
BF3447	Flake (distal)	1002N, 1002E	L20	BF3488	Flake (proximal)	1002N, 1002E	L20
BF3588	Flake (distal)	1002N, 1002E	L21	BF4069	Flake (proximal)	1002N, 1002E	L21
BF3590	Flake (proximal)	1002N, 1002E	L21	BF3622	Flake (distal)	1002N, 1002E	L21
BF3606	Flake (distal)	1002N, 1002E	L21	BF3736	Flake (proximal)	1002N, 1002E	L21
BF4173	Tool (proximal)	1002N, 1002E	L22	BF4220	Tool (medial)	1002N, 1002E	L22
BF4285	Flake (distal)	1002N, 1002E	L22	BF4290	Flake (medial)	1002N, 1002E	L22
BF4711	Debris	1002N, 1002E	L23	BF5063	Debris	1002N, 1002E	L23
BF5046	Flake (medial)	1002N, 1002E	L23	BF5047	Flake (distal)	1002N, 1002E	L23
BF5112	Flake (distal)	1002N, 1002E	L23	BF5113	Flake (proximal)	1002N, 1002E	L23
BF5139	Debris	1002N, 1002E	L23	BF5140	Debris	1002N, 1002E	L23
BF5219	Tool (medial)	1002N, 1002E	L23	BF5221	Tool (distal)	1002N, 1002E	L23
BF5818	Debris	1002N, 1002E	L24	BF5822	Debris	1002N, 1002E	L24
Disturbed units							
BF104	Core (fracture)	1002N, 1001E	L9	BF136	Other/Undet.	1002N, 1001E	L9
BF133	Tool (medial)	1002N, 1001E	L9	BF6097	Tool (proximal)	Burial	Burial
BF533	Flake (proximal)	1002N, 1001E	L10	BF576	Flake (distal)	1002N, 1001E	L10
BF1792	Tool (medial)	1001N, 1001E	L13	BF1798	Tool (distal)	1001N, 1001E	L13
BF2242	Other/Undet.	1002N, 1001E	L14	BF2243, 2244, 2245, 2246, 2247	Other/Undet.	1002N, 1001E	L14
BF2629	Flake (medial)	1001N, 1001E	L15	BF2630	Flake (medial)	1001N, 1001E	L15

Table V: Overview of the mended refits in the MSA levels of Botlhano Fela (n=55) according to unit and level (Table: Myrer 2010)

Conjoined refits							
LID	Type	Unit	Level Refits with: (LID)		Unit	Level	
Undisturbed units							
BF1404	Preform	1002N, 1002E	L12	BF209	Flake	1003N, 1001E	L10
BF5524	Core	1002N, 1002E	L24	BF5525, 5551	Flakes	1002N, 1002E	L24
BF4205	Flake	1002N, 1002E	L22	BF5839, 5856, 4209, 5021, 3538	Flakes	1002N, 1002E	L22, 23, 24
Disturbed units							
BF573	Flake	1002N, 1001E	L10	BF1351	Flake	1002N, 1001E	L12
BF6186	Flake	1001N, 1001E	L14	BF2405	Flake	1002N, 1001E	L14
BF5977	Core	Burial	Burial	BF5979	Flake	Burial	Burial
BF6038	Core	Burial	Burial	BF6044	Flake	Burial	Burial

Table VI: Overview of the conjoined refits in the MSA levels of Botlhano Fela (n=19) according to unit and level (Table: Myrer 2010)